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The Hungry Harvest: Philanthropic Science and the Making of South Asia's Green Revolution, 1919–1964

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The Hungry Harvest:
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Dedication

For my Parents, and the many other teachers who made this possible

The Hungry Harvest:
Philanthropic Science and the Making of South Asia's Green Revolution, 1919–1964

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This dissertation examines how international development agencies and American philanthropic organization collaborated with the new Indian and Pakistani states in undertaking unprecedented interventions in the agricultural and nutritional sciences after Partition in 1947 and into the early years of the Cold War. Contrasting with existing scholarship on the changes that swept the world food economy in the mid-twentieth century, my work uncovers the linkages between late colonial and post-independence understandings of famine, population growth, and economic development in South Asia. I propose a broader framing of the Green Revolution of the 1960s, examining the resonance of eugenic theories within population control efforts and tensions between the nutritional and agricultural sciences through decolonization. To that end, I track the influence of the Rockefeller and Ford foundations, the Population Council, and UN agencies, such as the WHO and the FAO, in inaugurating programs of rural development, nutritional research, and resource management. I argue that efforts led by Indian nationalists, British colonial officials, and American philanthropists in the context of the global population 'crisis' of the 1940s and 1950s generated scientific institutions, networks, and ideas vital to the later Green Revolution.

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List of Abbreviations

AIIH&PH	All-India Institute for Hygiene and Public Health
CIMMYT	International Maize and Wheat Improvement Center
FAO	Food and Agriculture Organization of the United Nations
FF	Ford Foundation Records
GEB	General Education Board
IAP	Indian Agricultural Program of the Rockefeller Foundation
IARI	Indian (or Imperial) Agricultural Research Institute
IBRD	International Bank for Reconstruction and Development
IBWC	International Boundary and Water Commission
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
ICS	Indian (or Imperial) Civil Service
IHD	International Health Division of the Rockefeller Foundation
IIA	International Institute of Agriculture
IMS	Indian Medical Service
IOR	India Office Records and Private Papers, British Library
IRRI	International Rice Research Institute
MAP	Mexican Agricultural Program of the Rockefeller Foundation
NAI	National Archives of India
NMML	Nehru Memorial Museum and Library (Manuscripts Collection)
PC	Population Council Records
PEPSU	Patiala and East Punjab States Union
PSA	Punjab State Archives

RAC	Rockefeller Archive Center
RF	Rockefeller Foundation Records
TCA	United States Technical Cooperation Administration
TCM	United States Technical Cooperation Mission to India
TNA	The National Archives of the United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WBG	World Bank Group Archives
WHO	World Health Organization

Introduction: Foreseeing the Future

"I do not want to foresee the future. I am concerned with taking care of the present. God has given me no control over the moment following." –Mohandas K. Gandhi, 1924[1]

"The future is always obscure. The most reasonable predictions about trends in human affairs are apt to be falsified by events." –The Famine Inquiry Commission, 1945[2]

"[T]he future of India depends on reversing the dictum of the administrator and recognising that the scientist must be on top and not on tap." –P. C. Mahalanobis, 1961[3]

These three distinct visions of change over time — Gandhian, colonial, and developmentalist — reflect the fluid notion of progress in mid-twentieth-century India. During this period of global upheaval that brought tremendous economic and political change to South Asia, scientists, philanthropists, and government officials turned increasingly to the task of forecasting future trends in the growth and health of populations. Unlike Walter Benjamin's famous "angel of history" — gaze fixed upon the continuous wreckage of the past while blown forward by a storm called "progress" — these scientists and planners believed they could turn ahead and see where the wind would take them.[4] Indeed, many believed they controlled the storm itself. Yet this confidence was by no means uniform and faith in the ability of science to assuage the fears of the present and meet the needs of the future grew haltingly over time.

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[1] Mohandas K. Gandhi, *Young India, 1924-1926* (New York: The Viking Press, 1928), 448.
[2] *Final Report of the Famine Inquiry Commission*, (Delhi: Government of India Manager of Publications, 1945), 87.
[3] P. C. Mahalanobis, *Talks on Planning*, Indian Statistical Series (Calcutta: Asia Publishing House, 1961), 110.
[4] Walter Benjamin, *Illuminations*, trans. Harry Zohn (New York: Harcourt, Brace & World, 1968), 257-8. Benedict Anderson also references Benjamin's chapter, "Theses on the Philosophy of History," in the posthumously-published *Illuminations*. See, Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (London: Verso, 1983), 147.

Gandhi, for instance, vehemently rejected the bold promises of western science and medicine, writing the above passage as he attempted to heal a rift within the Congress Party after the violence of Chauri Chaura incident in 1922.[5] His reluctance to forecast India's political future, he reflected, turned him to the spinning of *khadi* as a means of building national unity through self-improvement and work-discipline — a simultaneous rejection of mechanization and the technological future it heralded.[6] Two decades later, the colonial government's Famine Inquiry Commission similarly abstained from the business of prediction. The context, however, was jarringly different. Written largely by the Anglo-Irish nutritionist W. R. Aykroyd, the final report of the commission of Indian and British scientists examined the causes of the 1943-44 Bengal Famine. The famine had left over three million dead, shocking colonial medical officials who believed such crises had been relegated to the Victorian past.[7] The Commission refused to forecast an approaching Malthusian catastrophe, placing the blame for the famine squarely on a historical "underdevelopment of resources" in rural Bengal and not on overpopulation, as other analyses at the time suggested.[8] Demanding a break with the laissez-faire past of colonialism, the commission called upon the ailing colonial state to launch a broad program of "nation building" to generate economic and social development in India.[9]

Sixteen years later, statistician P. C. Mahalanobis, encouraged the independent Indian state to place scientists at the helm of development efforts, stressing: "I have a deep conviction that scientists must supply the leadership in national development. It is

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[5] Judith M. Brown, *Gandhi: Prisoner of Hope* (New Haven: Yale University Press, 1989) 203.
[6] Gandhi, *Young India,* 449.
[7] Amartya Sen, *Poverty and Famine: An Essay on Entitlement and Deprivation* (Oxford: Oxford University Press, 1981), 52.
[8] *Final Report of the Famine Inquiry Commission*, 73.
[9] Ibid., 331.

necessary that they should take the initiative."[10] The accomplished Bengali statistician had himself designed India's Second Five-Year Plan, from 1956 to 1961, in which he had emphasized rapid industrialization and the expansion of public sector programs.[11] In striking contrast to Gandhi's spiritual dedication to matters of the present, Mahalanobis' thinking resembled the Western-style approach to development promoted by Jawaharlal Nehru, for whom the United States, the Soviet Union, and, later, Japan and China, were models of industrial progress. As India's first prime minister, Nehru staunchly advocated a combined strategy of growth promotion and inequality reduction that enabled the new state to sustain the fragile 'Gandhian-socialist consensus.'[12] In spite of his support for rapid industrialization, Mahalanobis also advocated for a scientific reorganization of the nation's agricultural sector along cooperative lines, with detailed targets for farm outputs extending ten to fifteen years into the future.[13] Naturally, agronomists, nutritionists, and social scientists would be placed at the helm of this renewed effort to establish Indian self-sufficiency in food production and end the cycle of famine that had defined British colonialism.

This dissertation centers on the work of a handful of nongovernmental institutions that assumed influential roles in public health and agricultural development across South Asia during the 1940s and 1950s I show that, in the course of decolonization, these institutions — including the Rockefeller and Ford foundations, the Population Council, the World Bank Group, the World Health Organization (WHO), and the Food and Agriculture Organization of the United Nations (FAO) — formulated ideas and practices that became

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[10] Mahalanobis, 110.
[11] Francine R. Frankel, *India's Green Revolution: Economic Gains and Political Costs* (Princeton, NJ: Princeton University Press, 1971), 122.
[12] Ibid., 17-18.
[13] Ibid., 128.

central to international development discourse in the postwar world. The scientists, economists, and other experts affiliated with these organizations collaborated closely with the governments of independent India and Pakistan, as well as their imperial predecessor, undertaking scientific research and rural development initiatives aimed at transforming landscapes and reordering populations.

Crucially, however, I argue that nationalist and colonial era concerns over public health, population management, and rural extension also shaped the agendas of the philanthropic organizations and international agencies that entered South Asia after independence. Indeed, the careers of many Indian and British imperial scientists spanned Partition as they shifted from roles in colonial institutions to positions in new international ones. Further, local interests guided how these global nongovernmental organizations conducted research and attempted interventions in population control, nutritional health, and agricultural development. In this way, my dissertation places the later Green Revolution in the context of a long period of South Asian decolonization, speaking to both colonial and postcolonial historiographies. This analysis shows that the ideas, institutions, and global networks that enabled the global Green Revolution emerged as scientists, philanthropists, and government officials worked to regulate rural populations and reorganize South Asia's food economy after Partition and into the 1950s and 1960s.

During the two decades following independence in 1947, visions of a national future marred by persistent food shortage and runaway population growth reflected postwar fears of global overpopulation.[14] The 1951 Census of India, the first after independence, gloomily projected that India's food production capabilities would not keep up with a

[14] Matthew Connelly, *Fatal Misconception: The Struggle to Control World Population* (Cambridge, MA: Belknap Press, 2008), 145.

population of 361 million expanding at an annual rate of four to five million.[15] The census commissioner, R. A. Gopalaswami, wrote that Indian agriculture needed a "near-miracle" to feed an estimated 520 million Indians by 1981. As to whether that miracle would come, Gopalaswami was not optimistic, particularly considering India's lack of a large-scale family planning initiative.[16] That said, the demographer's grim calculations did not go uncontested. For instance, the agronomist P. C. Bansil wrote that while Gopalaswami had accurately assessed the nation's low agricultural production levels, he had failed to see the ample room for improvement. As he wrote: "The Neo-Malthusians find support in their theories in the exhausted land and prolific motherhood of India. The wisdom of such findings are [*sic*], however, questionable."[17] Instead, Bansil predicted that innovations in the agricultural and nutritional sciences would secure India's welfare in time.

This analysis explores how, when taken together, the fear of the future described by Gopalaswami, and the faith in science professed by Bansil, drove India toward the Green Revolution of the 1960s and 1970s, in which high-yielding wheat and rice varieties, chemical fertilizers, and other technologies deployed in South Asia by American philanthropic organizations doubled food production.[18] Defined and driven in part by the work of these American foundations, South Asia's Green Revolution would build upon their earlier investments in agriculture in Mexico and the United States during the interwar years and through the 1940s. The high-yielding grain varieties generated by these initial experiments led American agricultural scientists to emphasize increased production over issues of food distribution nutritional and quality in their efforts to combat hunger. This

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[15] R. A. Gopalaswami, *Census of India, 1951 (Part 1-a – Report)*, vol. 1 (New Delhi: Government of India Press, 1953), 181.
[16] Ibid., 191.
[17] P. C. Bansil, *India's Food Resources and Population* (Bombay: Vora & Co., 1958), 1.
[18] Raj Patel, "The Long Green Revolution," *The Journal of Peasant Studies* 40 (2012): 6.

focus upon production increases would become the hallmark of the Green Revolution lauded by American philanthropic organizations and international development agencies through the late 1960s and 1970s. At the same time, and as Raj Patel and others have shown, the Green Revolution constituted a global phenomenon that spanned much of the twentieth century, representing broad changes in agricultural science and practice, harnessed at various times to respond to varied economic and social demands and to accomplish a wide array of political ends.[19] Within that patchwork of justifications and contexts, decolonization in South Asia played a central role in setting the pace and purpose of the broad scientific changes underpinning this long Green Revolution.

SCIENCE AND DEVELOPMENT IN THE CONTEXT OF DECOLONIZATION

Through the narratives of scientific and social change I examine here, I seek to improve our understanding of how decolonization in South Asia influenced global health priorities, shaped the evolution of the agricultural sciences, and facilitated the rise of an international development discourse. To that end, I examine attempts to reconfigure society and to regulate human bodies in a longer era of South Asian decolonization. Beyond offering an analysis of the changes wrought by Partition and its immediate aftermath, I work within a wider historical frame that extends roughly from the time of the First World War to the early 1960s — the eve of the Rockefeller Foundation's initial introduction of high-yielding wheat varieties commonly associated with the food production increases of the Green Revolution. Covering the height of the Indian nationalist movement and late colonial attempts to retain power in South Asia, this period of analysis also captures much of the life of the Rockefeller Foundation in India, from the organization's early funding of

[19] Ibid.

medical efforts to combat hookworm disease and malaria beginning in 1913.[20] I pay particular attention to the planning stages of the Population Council and the Rockefeller Foundation's initial interventions in India in 1952 and 1956, respectively, as well as the Ford Foundation's first work in community development beginning in 1952, coordinated through the Point Four initiative of the Truman Administration. These early planning efforts prove telling because they expose the limitations built into efforts by philanthropic organizations, international agencies, and national governments to reshape South Asia's food economy from the very beginning. This strategic planning, and the story of the earliest explorations made by these organizations into the agricultural sciences and rural extension in colonial and post-Partition India, have been frequently overlooked within histories of the Green Revolution.

In addition to setting a temporal frame of analysis that includes both the late colonial and early post-independence periods in South Asia, this work pays close attention to what can be learned from the careers of the scientists, physicians, and economic experts whose careers spanned Partition. For instance, the correspondence of W. R. Aykroyd, the Anglo-Irish director of the Nutrition Research Laboratories at Coonoor who went on to direct the Nutrition Division of the FAO in Rome, offers tremendous insight into nutritionists' views of the postwar drive to grow more food through investments in the agricultural sciences. Strikingly, the "conquest of famine," as Aykroyd would later refer to the international efforts of the 1960s to eliminate global hunger, often stood as a secondary objective in the initial planning phases of scientific intervention.[21] Instead, the striking of an abstract balance between population growth and food production represented the highest

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[20] Gary R. Hess, "American Philanthropic Foundations in India," in Soma Hewa and Darwin H. Stapleton, eds., *Globalization, Philanthropy, and Civil Society: Toward a New Political Culture in the Twenty-First Century* (New York: Springer, 2005), 55.

[21] W. R. Aykroyd, *The Conquest of Famine* (New York: Reader's Digest Press, 1975), 4-5.

goal of the non-governmental organizations that entered South Asia after Partition. In turn, the subsequent Green Revolution emerged, not from a purely humanitarian quest to prevent famine and hunger, but from a broader, longstanding effort to reorganize and manage India's population on many fronts — including family planning initiatives, community development projects, rural extension trainings, and laboratory and clinical investigations of the physiological experience of malnutrition. Placing their histories into conversation with each other and carrying their narratives across the temporal divide of 1947 brings the relationship between European imperialism and postwar developmentalism into sharp focus.

Understanding the impetus for innovations in the agricultural and nutritional sciences in independent India requires examining the ways in which the institutions of the late colonial era promoted — and failed to promote — public welfare. Here again, the work of colonial-era scientists like V. N. Patwardhan, Muktha Sen, and Albert and Gabrielle Howard demonstrates that nutritional health became a concern of colonial science much later than more lucrative scientific efforts to improve agricultural yields. Political pressure from Indian nationalists, as well as the material realities of the Great Depression, the Second World War, and the Bengal Famine, compelled the imperial state to attend more seriously to agricultural development and public health issues. The declining colonial administration strengthened the Imperial Agricultural Research Institute (IARI) and established the Central Rice Research Institute in 1944.[22] Both institutions worked through the late 1940s and 1950s to produce high-yield grain varieties and improve methods of soil fertilization for the Indian agricultural sector. Both also established close relationships with

[22] Amanda Carroll Waterhouse, *Food & Prosperity: Balancing Technology and Community in Agriculture* (New York: The Rockefeller Foundation, 2013), 141.

the Rockefeller Foundation after it shifted its attention to the agricultural sciences in India after 1956.

At the same time, as this dissertation shows, the Indian Medical Service (IMS) and imperial institutions, such as the Nutrition Research Laboratories at Coonoor and the All-India Institute of Hygiene and Public Health (AIIH&PH) in Calcutta, extended research into human dietary needs and diseases of nutritional deficiency in coordination with the Rockefeller Foundation. For instance, I track the narrative of the AIIH&PH's Singur Study Unit — a collection of villages in the Bengali countryside that began as a venue for nutritional research funded by the Rockefeller Foundation just after the Bengal Famine, and slowly evolved into one of the Population Council's first testing grounds in South Asia for teaching methods in birth control and family planning. My work also sheds light on the competing interests that fueled the nutritional and agricultural sciences, as well as population control efforts, as they pursued surprisingly disparate agendas. As I demonstrate, experts from each of these fields interpreted the major challenges of postwar international development differently. Nutritional research generally attended to concerns over the economic and social causes of malnutrition and diseases of deficiency; agricultural scientists and population control advocates focused more strictly on achieving a balance between human fertility and food production through scientific innovation and knowledge dissemination.

This dissertation also frames the scientific and rural development projects launched in cooperation with American and international organizations in the context of political debates over the proper course of development in India. At the core of these arguments stood a debate over whether to jettison imperial institutions and technologies, as advocated

by Gandhi, or to integrate them into a modern social democracy, as Nehru argued.[23] Nehru's position won the day and his government moved rapidly through the 1950s to expand agricultural infrastructure and scientific research through a series of five-year plans coordinated by a central Planning Commission. Appointed by the Interim Government in 1946, the permanent Planning Commission shifted the Indian state's approach to economic development, moving from the social change-focused First Five-Year Plan of 1951 to 1956 to the industrialization-driven Second Five-Year Plan of 1957 to 1962 that, as Francine Frankel has shown, still relied upon sustained investments in agricultural development.[24] Emphasizing the interventions of American philanthropic organizations and new international agencies over the well-studied discussions of the Planning Commission, I investigate the extent to which the new, development-oriented state altered the old objectives of imperial science in agriculture, nutrition, and population regulation on a practical level. To that end, I assess how Partition and subsequent, contentious rehabilitation programs contributed to broader investments in rural extension and community through the 1950s and 1960s.

With the wheat and rice-growing provinces of Bengal and Punjab divided and partially integrated into East and West Pakistan, India faced an unprecedented challenge in feeding its growing population. As I show here, Partition and its aftermath generated a political impetus for much wider investments in agricultural and community development across India. The borders drawn in 1947 disrupted agricultural production — cutting irrigation canals off from their sources, disrupting the flow of commodities across the subcontinent, and permanently displacing hundreds of thousands of agricultural laborers.

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[23] An exposition of Nehru's thought on this issue is found within Jawaharlal Nehru, *Nehru on Science and Society* (New Delhi: Nehru Memorial Museum and Library, 1988).

[24] Francine Frankel, *India's Political Economy, 1947-1977: The Gradual Revolution* (Princeton, NJ: Princeton University Press, 1978), 111-112.

Subsequently, Indian and Pakistani officials, along with representatives of the World Bank, turned to agreements governing resource-sharing and irrigation development in the Americas as models for settling disputes with Pakistan over irrigation rights in the Indus River Basin. In investigating these social and scientific changes through the first two decades following Partition, I show how India engaged with new international organizations to establish permanent legal and economic arrangements intended to secure improvements in hybrid seed development, soil fertility, and agricultural productivity.

In framing global efforts to transform agriculture during the postwar era within the context of South Asian decolonization, this dissertation charts the emergence of American philanthropic organizations such as the Rockefeller and Ford foundations, as well as the Population Council, in influencing Indian food and population policy. While scholars have documented the work undertaken by these organizations during the Cold War across Asia, Latin America, and the Caribbean, less attention has gone to their earlier efforts beyond North America before the end of the Second World War. I show that the influence of such organizations grew haltingly, long before the end of empire in South Asia. In 1935, for instance, the Rockefeller Foundation established a field office in Delhi to coordinate an array of public health projects they had been developing across colonial India since the 1910s. Following independence, the foundation shifted from supporting medical research and public health institutions in India toward heavier investments in the agricultural sciences and rural development.[25] During the interwar years, however, representatives of the Rockefeller Foundation also investigated the potential for investments in rural extension and agricultural development, long before the official launch of the foundation's Agricultural Research Program (IAP) in 1956. My investigation of these early inquiries on

[25] For an early first-hand account of Rockefeller Foundation investments in Mexico, see Norman Borlaug, *The Green Revolution, Peace and Humanity* (Mexico City: CIMMYT, 1972).

the part of the American philanthropy helps to reveal connections between Rockefeller-funded rural extension work through the General Education Board (GEB) in the American South and the efforts of agricultural experts like Sam Higginbottom and Arthur T. Mosher whose work at the Allahabad Agricultural Research Institute had roots in the Presbyterian mission movement.

While Britain's withdrawal from the subcontinent in 1947 allowed American organizations a freer hand in funding the sciences, I show that the Rockefeller Foundation spent nearly a decade determining exactly what direction to take in South Asia. Though the organization's top scientists and administrators had identified an imbalance between population growth and food supply as the chief challenge facing India, they hotly debated the foundation's precise angle of approach. Close attention to this planning phase uncovering the nature of the organization's motivations in South Asia reveals a great deal about Rockefeller scientists' thinking on race, gender, and population growth. In turn, this understanding helps to explain how the Green Revolution of the 1960s unfolded as it did.

Though I take the story of the origins of the Green Revolution in South Asia beyond its usual Cold War framing, the broader dimension of postwar geopolitics remains critical within my work. In particular, the rise of international development discourse in the context of South Asian decolonization illuminates how changes within India reflected the scientific innovations and policy recommendations of emerging organizations like the Food and Agriculture Organization of the United Nations (FAO), and World Health Organization (WHO). Through those agencies, and in collaboration with American philanthropic organizations, Indian and former British colonial scientists became increasingly involved in worldwide scientific networks in the 1950s and 1960s. As Matthew Connelly notes: "A

transnational network of population experts took up where empires left off."[26] Indeed, this phenomenon is as apparent within the agricultural and nutritional sciences as it is for the networks employed by global population experts. Guided by American investments and shaped in part by Cold War priorities, these networks connected research institutions in India with similar institutions in Latin America, Southeast Asia, and Africa. In this way, American-led initiatives integrated agricultural knowledge produced in India and across the decolonizing and developing world into an important component of Green Revolution research. Unlike earlier work by Nick Cullather, John H. Perkins, and others who focus chiefly on the Cold War context of the Green Revolution, I seek a more local context to the broad narrative of agricultural change that swept the globe during the late 1960s and 1970s.[27] In turn, I hope to show that development initiatives and scientific investigations undertaken in South Asia in during a long period of decolonization shaped the theories and practices deployed by international development organizations and philanthropic foundations on a global scale.

TRACING THE ROOTS OF THE GREEN REVOLUTION

Whether viewed in a positive or negative light, whether interpreted as reducing hunger or exacerbating poverty, the term 'Green Revolution' itself is frequently employed in vague, catch-all ways that can imply that it is outside history. The term, at least, has a definite origin. William Gaud, then director of the United States Agency for International Development (USAID), coined the label 'Green Revolution' in 1968 to describe the substantial increases in global food grain production of the late 1960s. Attributing these

[26] Connelly, 9-10.

[27] See, for instance, Nick Cullather, *The Hungry World: America's Cold War Battle against Poverty in Asia* (Cambridge: Harvard University Press, 2010) and John H. Perkins, *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War* (New York: Oxford University Press, 1997). For a 'first-hand' account of the Green Revolution written by a former director of the Indian Agricultural Research Institute (IARI), see H. K. Jain, *The Green Revolution: History, Impact, and Future* (New Delhi: Studium, 2010).

increases to the promotion of high-yielding grain varieties, chemical fertilizers, and pesticides advanced by philanthropic organizations like the Rockefeller and Ford foundations, Gaud projected the term back over an indeterminate period of the past. Its precise historical origins left obscure, Gaud described the Green Revolution in a speech to the Society for International Development in Washington, DC. As he observed: "[D]evelopments in the field of agriculture contain the makings of a new revolution. It is not a violent Red Revolution like that of the Soviets, nor is it a White Revolution like that of the Shah of Iran. I call it the Green Revolution."[28] Situated firmly in a comparison with political upheaval in Russia and Iran, the term 'Green Revolution' immediately took on an association with the geopolitical struggles of the Cold War and the longer twentieth-century battle between communism and capitalism. Indeed, in many ways, these associations proved to be warranted. Yet, associating the changes that Gaud described as characteristic of the Green Revolution exclusively with American scientific aid and strictly in the context of the Cold War inhibits our understanding of important economic and scientific phenomena of the twentieth century.

Recent scholarship on the origins of Green Revolution emphasizes the role of Cold War-era technological aid to South Asia in addressing poverty and postwar concerns regarding food shortage and overpopulation. In his work on the origins of the Green Revolution in the context of the strategic distribution of scientific aid by the United States during the Cold War, Nick Cullather rightly highlights the connection between efforts to increase agricultural production and an emerging international development discourse. As he argues: "Rather than a contingent process unfolding in history by its own rules and on its own schedule, 'development' by 1948 had acquired a transitive meaning, as a procedure

[28] Patel, 5.

performed by one country upon another."[29] At the same time, this characterization neglects the fact that this development was not always "performed" with intention or apparent strategy. Instead, it had begun to emerge in the postwar world as a global system in and of itself, involving ever-expanding knowledge networks, new international agencies and philanthropic organizations, and the sharing of vital economic and demographic information through education and training.

I argue that international development efforts in the immediate postwar period involved the exchange of ideas between experts working in multiple contexts around the world, working to establish sets of 'best practices.' Much like the 'legibility' described by James C. Scott in efforts to simplify, understand, and control both nature and crop production, the postwar investments in South Asian agricultural development and extension attempted to compile a central clearinghouse of agronomic knowledge.[30] Whether codified in handbooks or study reports, academic journals or field training sessions, these best practices represented theories tested and results recorded in a quest to generate a replicable model of social change, agronomic investment, and economic growth. Of course, that is not to say that these exchanges occurred in an egalitarian fashion or that they did not fall under the disproportionate influence of powerful, self-interested parties like national governments or multinational corporations. They clearly illustrate the "imperial pretensions of agronomic science" rightly emphasized by Scott.[31] At the same time, however, the development projects launched in South Asia through the 1950s often grew up around existing Indian institutions which had their own nationalist and colonial legacies. Their rapid, often haphazard, rise reflects the sense of urgency that prevailed

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[29] Cullather, 40.
[30] James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, CT: Yale University Press, 1998), 262-264.
[31] Ibid., 264.

among Indian, American, and British experts who sought to address food shortage and overpopulation as the central impediments to economic and political stability in the region.

Further, by de-emphasizing the ramifications of decolonization and the lingering effects of colonial priorities in South Asia, Cullather overestimates the planning acumen of American philanthropic organizations. For instance, Mexico did not represent a "staging area" for the Rockefeller Foundation's "conquest of hunger in Asia," as Cullather puts it.[32] Such a description implies a concerted plan with previously identified political objectives. The process unfolded in a far more haphazard way, with Foundation officials frequently uncertain as to whether their organization would invest in the agricultural sciences in South Asia, much less derive any transferable findings from their on-going work in Mexico. In this way, Cullather's important survey of the Green Revolution's Cold War origins overlooks the sheer uncertainty and capriciousness involved in the philanthropic planning process. After all, the Rockefeller Foundation's interest in independent India began with discussions of how to invest effectively in public health. This, in turn, led to a consideration of health in the context of rapid population growth, which brought officials to the view that South Asia's central problem was a 'double crisis' of overpopulation and food shortage. More importantly, the wheat and maize hybridization work undertaken in Mexico by the Rockefeller Foundation during the 1940s and 1950s closely resembled the simultaneous efforts in grain yield improvement undertaken by Indian and British colonial scientists. As this dissertation shows, scientific work to improve grain yields reflected a long, global effort involving, among many others, Indian, Mexican, American, and British scientists.

The Rockefeller Foundation was hardly alone in advancing this agenda and certainly did not plan for the combination of innovations that became characteristic of the

[32] Cullather, 42.

later Green Revolution. Indeed, Rockefeller Foundation officials began to take interest in South Asian agriculture in the 1910s, but this curiosity proved to be as sporadic as it was longstanding. As late as 1952, just four years before the foundation launched its agricultural program in New Delhi, representatives of the organization continued to debate whether their efforts might be more effective if restricted to efforts in public health. Joseph Cotter, writing in the context of the emergence of the Rockefeller Foundation's Mexican Agricultural Program (MAP), tracks the improvised ways in which Rockefeller scientists cobbled together their projects through the 1940s.[33] More importantly, Cotter's work situates the Rockefeller Foundation's mercurial efforts in the run-up to Mexico's Green Revolution in the context of a broader history of agricultural development concerns within the nation. This methodology enables a narrative that is highly attentive to the broader context of Mexican history. This attention to local circumstances and concerns is admirable and shows how the MAP established close relationships with existing Mexican institutions and tailored its scientific investigations to the priorities of Mexico's federal government. In a similar way, as this dissertation shows, Rockefeller Foundation scientists and officials working in India paid close attention to the needs and demands of their host government. Indeed, this relationship often blurred the lines between the two entities — with Rockefeller sharing extensive information on human subjects gathered during its research, and with the Government of India allowing national research institutions, like the IARI, to be managed directly by the foundation.

In contrast with Cullather's broad, global-level analysis, other scholars have engaged with the phenomena associated with the early Green Revolution in the local South Asian context. Madhumita Saha, for instance, underscores the importance of domestic

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[33] Joseph Cotter, *Troubled Harvest: Agronomy and Revolution in Mexico, 1880-2002* (Westport, CT: Praeger, 2003), 179-180.

innovations in wheat and rice research to agricultural development in India during the 1940s and 1950s — well in advance of the Rockefeller Foundation's work on the same food grains in South Asia.[34] Her analysis demonstrates the cynical nature of American aid to India, rightly relieving such overtures of their humanitarian rhetoric and demonstrating that the United States distributed aid to retain a vital ally in the Cold War.[35] Saha's work shows that research into high-yielding grain varieties on the part of Indian and late colonial research institutions was already well underway by the time Rockefeller and Ford developed their interest in South Asia. I build upon this assertion, attempting to frame the work of both philanthropic organizations in the much wider, long-running work of agriculture scientists and institutions the world over. Though less concerned with framing an origins story of the Green Revolution, Joseph M. Hodge draws heavily upon colonial and environmental historiographies in his work on late colonial agricultural science.[36] The troubled scientific innovations that Hodge examines in the context of British colonialism in Africa, Southeast Asia, and the Caribbean do, however, similarly demonstrate the enduring implications of imperial rule for agricultural development. In turn, Hodge reveals the "lingering presence and influence of […] colonial experts," following formal decolonization.[37] I find Hodge's analysis particularly useful to my investigation of how the FAO and the Ford Foundation engaged and employed former colonial experts in India through the course of their projects in nutritional science and agricultural development.

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[34]Madhumita Saha, "The State, Scientists, and Staple Crops: Agricultural "Modernization" in Pre-Green Revolution India," *Agricultural History* (2013): 204.
[35] Ibid.
[36] Joseph Morgan Hodge, *Triumph of the Expert: Agrarian Doctrines of Development and the Legacies of British Colonialism* (Athens, OH: Ohio University Press, 2007).
[37] Joseph M. Hodge, "'British Colonial Expertise, Postcolonial Careering and the Early History of International Development,'" *Journal of Modern European History* 8, no. 1 (2010): 24.

The works of Saha and Hodge thus establish a wider temporal framework within which changes and continuities in postcolonial agriculture can be explored.

Broadening the context in which South Asia's Green Revolution occurred also involves engaging with recent work on global population and the eugenic origins of international efforts to counter the perceived postwar overpopulation crisis. Matthew Connelly, for instance, examines the "politics of population," providing an incredibly useful context for the motivations behind India's postcolonial investments in agricultural development.[38] Deeply relevant to the concerns of this dissertation, Connelly examines the interests involved in the rise of the Population Council in the early 1950s, providing a window into early assessments of postwar population growth in South Asia. As Connelly shows, Population Council officials found a receptive audience for their family planning advocacy in India, with nascent efforts in fertility control already in motion. [39] Connelly's work provides a firm context for this dissertation's analysis of how the nutritional sciences and community development efforts intersected with population control interests in India during the 1950s and early 1960s. I contribute an investigation of specific family planning 'action research' initiatives funded by both the Population Council and the Rockefeller Foundation in rural West Bengal and East Punjab. Here again, I show that demands for a reordering of India's rural society following Partition opened the door to initial forays in population research and control on the part of American philanthropic organizations. These initiatives reflect the broader context of population management in which agricultural research and rural extension education unfolded.

Similarly, Alison Bashford's work provides a detailed assessment of the historical origins of neo-Malthusian concerns regarding postwar population that motivated new

[38] Connelly, 1-2.
[39] Ibid., 182.

efforts in the agricultural and nutritional sciences in independent South Asia. In addition to a wide investigation of the eugenic thought that influenced international thinking on population growth, Bashford highlights connections between biological notions of soil science and population health.[40] In this way, she clearly shows that nutritional and agricultural sciences as they emerged through the mid-twentieth century concerned themselves directly with thinking on population health and fertility. In showing the importance of soil conservation within the agendas of population control advocates such as the British biologist John Boyd Orr and the Indian demographer Sripati Chandrasekhar, Bashford's broad analysis demonstrates that the nutritional and agricultural sciences grew up through the mid-twentieth century in direct conversation with the politics of population control. My dissertation draws upon Bashford's analysis to investigate these intimate connections further, revealing the extent to which scientific thinking on soil and plant fertility in India emerged alongside concerns over nutritional quality and bodily health.

Tracking these broad social and scientific changes in the context of decolonization and an emerging international development discourse also requires a brief examination of the concept of a 'Green Revolution,' assessing its place within the historical narrative. Raj Patel has rightly critiqued the Green Revolution's social and environmental consequences, proposing a useful notion of the 'Long Green Revolution' that spans the twentieth century.[41] That said, Patel's analysis does not delve deeply into the local contexts and histories in which the policies and scientific research associated with the Green Revolution unfolded. Further, Patel leaves the door open for further examinations of the connections

[40] Alison Bashford, *Global Population: History, Geopolitics, and Life on Earth* (New York: Columbia University Press, 2014), 16.
[41] Patel, 1-2.

between the science of agricultural development, rural extension, nutritional health, and population control programming in what might be termed a 'broad' Green Revolution.

If only to avoid contorting the analytical frame even further, I prefer to approach the Green Revolution as a rhetorical product of wider changes within scientific and social thinking during the twentieth century rather than a coherent event or a broad epoch. The term serves as a short-hand for both the scientific efforts directed at agricultural 'modernization' during the 1940s and 1950s, as well as their material ramifications as they were deployed globally during the 1960s and 1970s. At the same time, these efforts came in the context of wider work to initiate social and economic change through scientific intervention across the developing and decolonizing world, in particular. By examining agricultural development in isolation from broader concerns over postwar population growth, economic development and public health, scholars have inadvertently reinforced a misleading notion of the Green Revolution as an external, monolithic force that entered India exclusively in the service of Cold War interests. The term has thus been used to describe certain types of science originating from specific geographic locations. Consequently, the important historical context of decolonization in South Asia is lost, the relationship between science and international development is understated, and, most critically, the human consequences of a wide array of often-misguided social experiments go uninvestigated.

PARTITION AND THE PATTERN OF DEVELOPMENT

In place of rigid temporal and thematic barriers, this dissertation assumes a long period of decolonization in South Asia, in which political, economic, and environmental change proceeded intermittently through the mid-twentieth century. At the same time, Partition, as a discrete event, played a powerful role in justifying later efforts by the

governments of India and Pakistan and international organizations to reorder populations in the new borderlands between India and the two wings of Pakistan. In seeking to understand how decolonization affected subsequent efforts in agricultural science and community development, this dissertation employs frameworks proposed by recent scholarship on Partition. Yasmin Khan's work, for instance, tracks the bloody division of a "society only partially emerging from long years of war."[42] She shows that the memory and aftermath of the division of the subcontinent endured for decades, shaping the economic institutions and political priorities of South Asia for decades to come. Similarly, Vazira Zamindar makes use of the concept of a "long partition" to explore the enduring experience of decolonization and its wider ramifications for the families and communities directly affected by it.[43] This notion proves particularly useful for understanding decolonization as the motivating force for the social and scientific interventions of the 1950s and early 1960s. Indeed, many of the nutritional and agricultural experiments conducted by Indian institutions supported by international agencies and American philanthropic organizations took place in two of the states most directly affected by Partition and its aftermath: West Bengal and East Punjab. Further, the community development and rural extension initiatives that gathered momentum across India through the 1950s drew directly from the Ministry of Rehabilitation's halting work in converting Partition's refugees into farmers. In these ways, Partition's aftermath had lasting, durable effects upon rural India, providing an impetus for both central government and international organizations to attempt a broad reorganization of agricultural production and, by extension, village life.

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[42] Yasmin Khan, *The Great Partition: The Making of India and Pakistan* (New Haven: Yale University Press, 2007), 17.

[43] Vazira Fazila-Yacoobali Zamindar, *The Long Partition and the Making of Modern South Asia* (New York: Columbia University Press, 2007), 6-7.

A transnational analysis is critical in interpreting the related phenomena of Indian nationalism, decolonization, and the emergence of the ideas that shaped independent South Asia's political economy. This approach builds upon political scientist Srirupa Roy's model for comprehending Indian nationalism's consolidation behind a program of national development following independence.[44] Roy shows that independent India fashioned its national identity by pulling together seemingly disparate ideas and institutions derived from societies beyond the subcontinent. This understanding of India's emerging postcolonial political identity is useful to my analysis of the scientific and economic ideas prevalent within efforts to reshape rural India through the 1950s. Manu Goswami's 2004 work, *Producing India,* also influences my examination of how postcolonial notions of development in South Asia took shape in a broadly transnational context while simultaneously constructing a distinctly national space.[45] If Indian nationalism generated an economic space distinct from a transnational context, then perhaps the same holds true for postcolonial thinking on agricultural development, population regulation, and nutritional welfare that emerged during the late 1940s and 1950s.

Along those lines, Partition and its aftermath created an impetus for the rural rehabilitation and community development initiatives that would be supported by the Ford Foundation and the United States Technical Cooperation Administration (TCA) through the 1950s. Tai Yong Tan and Gyanesh Kudaisya have shown that post-Partition rehabilitation played a vital role in reshaping rural East Punjab — territory that today constitutes much of the state of Haryana. They argue that this restructuring of rural society contributed in part to the substantial wheat production increases of the 'Green Revolution'

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[44] Srirupa Roy, *Beyond Belief: India and the Politics of Postcolonial Nationalism* (Durham, NC: Duke University Press, 2007).
[45] Manu Goswami, *Producing India: From Colonial Economy to National Space* (Chicago: University of Chicago Press, 2004).

of the late 1960s and 1970s.[46] Earlier work by Kudaisya meticulously charts the economic reconfiguration of East Punjab's agricultural sector in the aftermath of Partition.[47] The significant role played by American philanthropic organizations in this restructuring, however, remains unclear. In the context of West Bengal, Joya Chatterji has also shown how the post-Partition plan of rehabilitation generated unrest and mistrust through the state government's sluggish and inequitable resettlement efforts. Her work reveals that the Indian state coordinated with United Nations agencies to find the causes of 'social tensions' among West Bengal's Hindu refugees. Such inquiries framed refugees as subjects of social scientific investigation, justifying state and philanthropic efforts not merely to resettle, but to integrate these displaced peoples into a national community development program.[48] A very similar pattern can be observed in the experience of East Punjab and efforts supported by the Ford Foundation to organize refugee townships into model villages in a broader community development program.

More recently, Nicole Sackley and Daniel Immerwahr have shown that community development emerged as a contentious global movement of communitarian organizing, rural extension, and democratic empowerment from the 1930s through 1960s.[49] It represented a widely-replicated model of local-level interventions informed by social scientific inquiry, at times influenced by the Cold War priorities of the United States, and championed by a small cohort of international agencies and American philanthropic

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[46] Tai Yong Tan; Gyanesh Kudaisya, *The Aftermath of Partition in South Asia* (New York: Routledge, 2000), 139.

[47] Gyanesh Kudaisya, "The Demographic Upheaval of Partition: Refugees and Agricultural Resettlement in India, 1947-67," *South Asia* XVIII, Special Issue (1995): 73-94.

[48] Joya Chatterji, "'Dispersal' and the Failure of Rehabilitation: Refugee Camp-Dwellers and Squatters in West Bengal," *Modern Asian Studies* 41, no. 5 (2007): 995-1032.

[49] Nicole Sackley, "Village Models: Etawah, India, and the Making of Development in the Early Cold War," *Diplomatic History* 37, no. 4 (2013): 749-778; Daniel Immerwahr, *Thinking Small: The United States and the Lure of Community Development* (Cambridge: Harvard University Press, 2015).

organizations, including the Ford and Rockefeller foundations. While vividly demonstrating the global dimensions of the community development movement, this work has done less to explore its relationship to local post-Partition rehabilitation efforts, situating such projects in the specific local context of decolonization. In this dissertation, I show that community development and rural extension programming emerged and gained traction within India as a means of addressing specific local crises, including the aftermath of the Bengal Famine and Partition. These local contexts do not detract from the global nature of efforts to reshape village life and rural society, but rather show that specific historical circumstances enabled their broad acceptance. In turn, the doctrines of development generated through such interventions show that the local experience of decolonization played an influential role in shaping the long-term agendas of global agencies.

THE COLONIAL ORIGINS OF DEVELOPMENT EXPERTISE

The era of decolonization that followed the Second World War saw the notion of a 'developing world' enter academic and official parlance as American philanthropic organizations and international agencies initiated their first interventions across Asia, Africa, and Latin America. I attempt to situate postwar efforts in agricultural development and population regulation in South Asia in the context of the scientific and economic expertise the postwar world inherited from collapsing colonial regimes. As the postwar international order took shape, older colonial development concerns helped to inform evolving notions of development. As Samantha Iyer argues:

> Because scholars have either failed or refused to connect American development theory to colonial precedents, we get the impression that they emerged independently as a simple matter of course, during the era of decolonization, from

> the shared belief that history is progressive or certain peoples are more civilized than others.[50]

In this way, the theories and practices underpinning British colonial development and science policies in South Asia through first half of the twentieth century informed their postcolonial successors. Indeed, as this dissertation shows, many of the colonial scientists and physicians involved in the agricultural and nutritional research efforts of the British Raj assumed influential roles within the new international organizations of the postwar world.

These former colonial scientists and experts — both Indian and British — worked alongside representatives of American philanthropic organizations. In their work around the globe, the American representatives of these foundations developed their own political ethos in the aftermath of the Second World War and into the early years of the Cold War. Inevitably, experts who had built their careers as colonial civil servants or as scientists deeply involved in the nationalist cause encountered the "organization men" of the small world of American philanthropy. As Sackley observes:

> Field representatives shared with foundation leaders the reflexive anti-Communism and faith in science and expertise that was pervasive among US liberals in the mid-twentieth century. Long-term association with a particular foundation encouraged an "organization man" ethos, in which foundation officers, cycling between New York and field assignments, became inculcated in the practices and terminology of their philanthropy.[51]

Among this varied collection of ascendant international development experts and philanthropists, postwar debates over rural development and global health picked up colonial concerns over agricultural productivity and human fertility where they had been

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[50] Samantha Iyer, "Colonial Population and the Idea of Development," *Comparative Studies in Society and History* 55, no. 1 (2013): 67.

[51] Nicole Sackley, "Foundation in the Field – the Ford Foundation's New Delhi Office and the Construction of Development Knowledge, 1951-1971," in *American Foundations and the Coproduction of World Order in the Twentieth Century*, ed. John Krige; Helke Rausch (Göttingen: Vandenhoeck & Ruprecht GmbH & Co., 2012), 233.

left off. As Subir Sinha terms it, the rising 'developmentalist state' that such experts supported in their work, itself represented an ideal of progress to be achieved through political reform, economic reorganization, and the deployment of new technologies across industry and agriculture.[52] Through the 1950s and 1960s, development discourse also enabled postcolonial nation-states to exert economic power and establish political clout. As Sugata Bose argues, "Planning for development enabled the postcolonial state to 'claim its legitimacy' as an embodiment of the 'will of the nation.' It was in its 'legitimising role' that the idiom of planning for national development 'was to become an instrument of politics.'"[53] Considering independent India's rapid move to launch infrastructural and agricultural development projects following Partition, Bose argues that development served Nehru's governing Congress Party as a means by which it could deliver on the public welfare provision promises asserted during the nationalist struggle.[54] This notion of employing development to establish legitimacy is useful in understanding why independent India launched the wide variety of rural development projects it did through the 1950s. My work shows that India's collaborations with international agencies and philanthropic organizations over the same period served much the same purpose, enabling the new state both to provide for and police its population.

Much like the colonial regime that preceded it, the developmentalist state deployed power in highly bureaucratic ways, helping to formulate a global discourse of international development. Considering the emergence of international development in the wake of the

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[52] Subir Sinha, "Lineages of the Developmentalist State: Transnationality and Village India, 1900-1965," *Comparative Studies in Society and History* 50, no. 1 (2008): 57-58.
[53] Sugata Bose, "Historical Origins of the Concepts of Colonial and National Development," in Frederick Cooper and Randall Packard, eds., *International Development and the Social Sciences: Essays on the History and Politics of Knowledge* (Berkeley, CA: University of California Press, 1997), 48.
[54] Ibid.

Second World War, Frederick Cooper and Randall Packard identify the central assumptions of the discourse:

> It is possible to discern a wide—but far from universal—set of operating assumptions considered to constitute a 'development orthodoxy': that of foreign aid investment on favorable terms, the transfer of knowledge of production techniques, measures to promote health and education, and economic planning would lead impoverished countries to be able to become "normal" market economies.[55]

Efforts in rural development, population management, and public health by international agencies and American philanthropic organizations operating across South Asia after 1947 can be comfortably situated within this description. With the objective of stimulating economic production, colonial development programs and the independent development regimes that succeeded them tended to bring centralized power together with scientific resources to accomplish their goals of increased productivity. Collaborations with philanthropic organizations and international agencies enabled postcolonial states to contribute to 'development orthodoxy' as they projected power through increasingly sophisticated scientific, educational, and public health apparatuses.

This dissertation shows that through development's emphasis on amplifying the productive capacity of agriculture, postwar international agencies and philanthropic organizations affected millions of lives through collaborations with the new nation-states of South Asia. For example, the broad community development and rural extension programs launched by the Government of India in conjunction with the Ford Foundation and the TCA reveal how 'transnational development regime,' as Sinha describes it, expanded rapidly across India after Partition.[56] Sinha's work further tracks the lineage of this global development discourse — including the institutions, practices, and assumptions

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[55] Cooper and Packard, 2.
[56] Sinha, 57-58.

of modern international development — to the earlier rural reconstruction projects of Indian nationalists, British colonial officials, and American planners alike. Similarly, my work shows that rehabilitation projects in East Punjab and West Bengal, and the national community development program they inspired, greatly extended this transnational development regime. In this way, I build upon Sinha's definition of this transnational mode of development, showing that community development and rural extension projects across India enabled the exchange of information and best practices in agricultural development. The community development program that emerged in India in the 1950s definitively influenced and shaped an emerging body of development expertise on issues ranging from rural education and village governance to family planning and nutritional health.

NUTRITION IN COLONIAL MEDICINE AND INTERNATIONAL HEALTH

Visions of the colonial past and the immediate experience of the Bengal Famine of 1943-44 motivated independent India's planning efforts in securing an abundant future. In part a product of recalcitrant imperial administrations and extractive economic policies, famine rolled through colonial South Asia on a nearly regular basis from the famous Great Bengal Famine of 1770 onward.[57] Between 1876 and 1878, monsoon failures triggered a collapse of Indian's agricultural markets. Mass starvation ensued, sweeping Bengal, the Madras Presidency, the Central Provinces, and the Northwestern-Provinces, leaving over five million dead.[58] Twenty years later, at least another five million would die in a string of climate-related famines that punctuated the century in the Central Provinces, Berar, and much of the Bombay Presidency.[59] As Ira Klein argues of the ambivalence of the British colonial administration toward the major famines that swept India during the 1870s and

[57] Sen, 158-160.
[58] Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (New York: Verso, 2002), 23.
[59] Ibid., 119.

1890s: “Millions of lives were sacrificed in the nineteenth century because the pull of humanitarianism on the government and the elites was not so strong as the claims of Malthusianism and social Darwinism.”[60] Indeed, British laissez-faire orthodoxy compounded these crises, leaving the price of food grains unregulated and subject to speculation. As this dissertation shows, Malthusian concerns persisted with vigor into the twentieth century, merging seamlessly with the “humanitarianism” of the population control efforts of the 1950s and 1960s.

As Amartya Sen and others have shown, the famine that devastated Bengal between the summers of 1943 and 1944 cannot be adequately described as a strict food shortage nor can it be attributed exclusively to wartime disruptions. Much as the Famine Inquiry Commission suggested in 1945, it originated from long-running social and economic inequalities and the dominance of an inflexible, unresponsive colonial regime.[61] The famine was, at once, a public health crisis and a broader social crisis. Along with famine, epidemic diseases including malaria, cholera, and small pox ravaged the eastern Indian provinces. In conjunction with disease, the deprivations and diasporas of war further strained the beleaguered agricultural region and its urban centers of Calcutta, Dacca, and Chittagong, and contributed to the initial grain shortages following the Japanese invasion of Burma.[62] Madhusra Mukherjee argues that the British Empire, along with the economic and political reasoning that guided it, played a deadly role in the crisis that swept Bengal. In a similar vein, this dissertation inspects contemporary interpretations of the famine, showing that British and Indian understandings of its causes drove late colonial and post-

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[60] Ira Klein, "When the Rains Failed: Famine, Relief, and Mortality in British India," *Indian Economic Social History Review* 21, no. 2 (1984): 189-190.
[61] Sen, 215-216.
[62] Paul R. Greenough, *Prosperity and Misery in Modern Bengal: The Famine of 1943-1944* (New York: Oxford University Press, 1982), viii.

independence development initiatives, including the Grow More Food campaign and the interconnected rehabilitation and community development initiatives of independent India. To that end, I examine how, in the wake of the Bengal Famine, Indian nationalists, American humanitarians, and even a few prominent British scientists argued for a more serious state-led engagement of nutritional health and agricultural development in South Asia. I show that this new impetus for establishing India's self-sufficiency in food production played an important role in motivating independent India to launch projects of rural extension, population management, and agricultural development after 1947. It also drew the new Indian government into close relationships with American philanthropic organizations and international agencies promising financial and technological assistance.

This dissertation also seeks to inform discussions regarding the emergence of the nutritional sciences as a discrete field of inquiry and the rise of hunger as a concern of the welfare state. To that end, I employ James Vernon's notion of the "humanitarian discovery" of hunger in Britain to understand a parallel realization by Indian and British colonial scientists in the 1920s and 1930s.[63] Vernon shows that around the turn of the century, nutrition, or dietetics as it was then known, "attracted greater attention, as researchers investigated the nexus between health, economy, and productivity."[64] I show that a very similar range of concerns motivated nutritional scientists working in India during the late colonial period and well into the 1960s. This focus on the relationships between nutritional health and poverty would generate tensions between nutritionists and agricultural scientists as they worked to remedy the chief causes of hunger in India. Following the First World War, developments in laboratory and clinical research pushed the emerging nutritional sciences toward an explicit investigation of calorie absorption and vitamin deficiency.

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[63] James Vernon, *Hunger: A Modern History* (Cambridge, MA: Belknap Press, 2007).
[64] Ibid., 83.

While less situated in the racial and gender-based categories that defined the thought of earlier generations of scientists, the emerging nutritional sciences nonetheless sought to categorize and classify populations. As Michael Worboys argues of the emergence of the nutritional sciences within the British Empire during the interwar years: "Rooted in the basic sciences of physiology and biochemistry, nutritional science allowed a common approach to problems worldwide, which subjects like tropical medicine and tropical agriculture had previously denied."[65] Evolving rapidly in the interwar years, the nutritional sciences spanned a prominent divide between public health concerns and the agricultural sciences.

Similarly, David Arnold observes that, through the 1920s and 1930s, colonial demographers and scientists expressed concerns regarding the gap between India's population growth and its food production capacity.[66] While skeptical of the notion that the colonial state became aware of malnutrition as an object of medical study only late in the imperial game, Arnold shows that the nutritional sciences matured on a global level during the interwar years.[67] Indeed, as Kenneth J. Carpenter has shown, rapid developments in the identification of vitamins inspired scientific explorations of deficiency diseases like pellagra, scurvy, and rickets across Europe, the Americas, and, subsequently, Asia.[68] Owing to advances in biochemical laboratory analysis and nutritional survey methodologies in Europe and the United States, as well as the widening recruitment of nutritional scientists around the globe, the 1930s came to be known by later nutritionists as

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[65] Michael Worboys. "The Discovery of Colonial Malnutrition between the Wars," in David Arnold, ed. *Imperial Medicine and Indigenous Societies* (Manchester: Manchester University Press, 1988).
[66] David Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India," *The Indian Economic and Social History Review* 31, no. 1 (1994): 17.
[67] Ibid.
[68] Kenneth J. Carpenter, "A Short History of Nutritional Science: Part 3 (1912-1944)," *The Journal of Nutrition* 133 (2003): 3023.

"the golden age of nutrition."[69] Further, as Sunil Amrith argues, "Although the nutritional thought of the 1930s touched upon concerns about India's growing population, the emphasis on nutrition and sanitation worked, in many cases, *against* the popular claims of eugenicists."[70] The nutritional sciences thus placed great emphasis upon the resolvable nature of diseases of deficiency and departed from racialized notions of martial fitness and physique. My dissertation expands upon the analyses undertaken by Arnold, Carpenter, and Amrith, showing that the rise of the colonial era nutritional sciences continued through Partition, helping to set the agendas of international health agencies like the FAO and the WHO. I argue that the nutritional sciences in South Asia placed public health concerns into conversation with rising fears of overpopulation through the 1940s and 1950s. In this way, nutritional scientists would inform the priorities of the independent Indian state and help craft the agendas of international organizations like the FAO and the WHO following the Second World War.

CHAPTER OUTLINE

Looking ahead, this dissertation unfolds as follows: The first chapter, "Confronting the 'Double Crisis'," tracks the impetus for increased food production in South Asia as it drew upon the work of agricultural scientists and physicians in the late colonial period. During the 1920s and 1930s, the emerging nutritional sciences and a rising doctrine of social intervention in rural communities would influence the agendas of the philanthropic and new international organizations entering India after the Second World War. To show this influence, I present the narratives of agricultural scientists and rural extension experts at work in late colonial India, including Presbyterian missionary Sam Higginbottom,

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[69] Ibid., 3031.

[70] Sunil Amrith, *Decolonizing International Health: India and Southeast Asia, 1930–65* (New York: Palgrave Macmillan, 2006), 45.

agronomists Albert and Gabrielle Howard, and physicians Robert McCarrison and W. R. Aykroyd. I show that, well before formally launching an agriculture program in India in 1956, the Rockefeller Foundation experimented with rural extension by supporting the work of the missionary Higginbottom at Allahabad during the interwar years. Similarly, the American foundation supported investigations into malnutrition and deficiency diseases undertaken by McCarrison and Aykroyd in the Madras Presidency. In turn, late colonial ideas regarding the causes of famine and malnutrition directly informed later efforts to energize South Asia's food economy through rural extension training and agricultural education programs. Following the Bengal Famine of 1943-44 and Partition in 1947, fears of overpopulation and food shortage played a powerful role in driving efforts to reshape Indian agriculture. The urgency of this "double crisis" of food shortage and population growth, as the British writer Aldous Huxley termed it, justified the efforts of the Rockefeller and Ford foundations and the agencies of the United Nations in their first development initiatives across South Asia during the 1950s.[71]

In the next chapter, "A Road to New India," I show that independent India's community development initiatives of the 1950s emerged in significant ways from the immediate imperatives of post-Partition refugee rehabilitation. Building upon the example of the state-funded rehabilitation township of Nilokheri launched by S. K. Dey in East Punjab, along with a handful of other colonial-era models, the Ford Foundation and the TCA worked closely with the Government of India to launch nationwide community development and rural extension initiatives. The extension and training programs organized by the Allahabad Agricultural Institute under the direction of Arthur T. Mosher, for instance, helped to expand the reach of the Ford and Rockefeller foundations across

[71] Aldous Huxley, "The Double Crisis," *UNESCO Courier* April (1949): 6-9.

rural India in the quest to reorder the countryside and regulate the population. Pursuing such goals, the Government of India organized rural extension training programs that would take urban, college-educated Indians and convert them into village-level workers. Financed and lauded by American philanthropic organizations and international agencies alike, these ambitious programs of the 1950s show that the quest to address the 'double crisis' of overpopulation and food shortage went far beyond India's nutrition laboratories and agricultural experiment stations, pursuing broad social interventions across the subcontinent. At the same time, the community development methods tested at Nilokheri and refined in the rural extension training programs of the TCA and Ford Foundation failed to engage women effectively, drawing official scorn for neglecting half of India's rural population. Further, the bureaucratic heft of the new Ministry of Community Development complicated matters into the early 1960s. As community development programming repeatedly failed to deliver promised increases in food production, American philanthropic organizations and the Government of India concluded that direct funding for innovations in the agricultural and nutritional sciences would prove a more effective investment.

"Nourishing the Body," the third chapter, examines laboratory and clinical research that enabled a survey of the nutritional value of common foods in India. In taking laboratory methods into clinics and villages, this research conducted by Indian scientists and the FAO during the 1950s tracked the effects of privation upon the human body. I argue that this research reflected an intersection between the concerns of development economics and the nutritional sciences. In turn, it marked the beginning of an international food security discourse that has persisted for over half a century. This chapter also examines how investments made in South Asia by the Rockefeller Foundation and the FAO following the Second World War redirected and amplified the capacity of the nutritional sciences, particularly as funding poured in for the work of the All-India Institute of Hygiene

and Public Health and the Nutrition Research Laboratories at Coonoor and Hyderabad. The subsequent exchange of scientific knowledge and expertise profoundly shaped the global health priorities of both Rockefeller and the FAO, enabling the formation of an international network for the sharing of the fruits of research in the nutritional sciences. Into the early 1960s, nutritionists and agricultural scientists became increasingly engaged with one another's research agendas. The research program laid out by late colonial nutritional scientists would both reflect and resist the priorities of the production-focused brand of agricultural science advanced by the Rockefeller and Ford foundations through the 1950s and 1960s. Just as nutrition researchers approached vulnerable populations as their test subjects in postwar Europe and the Americas, FAO and Rockefeller-backed scientists in India pursued investigations into childhood and maternal nutrition, as well as the dietary needs of agricultural laborers and the rural poor.

The fourth chapter, "Into the Fertile Future," engages post-independence debates over the relation between agricultural production and population control. It also frames this discussion within the eugenic thinking of the 1920s and 1930s and the perceived global population crisis of the 1950s. It shows that Indian and American scientists associated with the Rockefeller Foundation and the Population Council connected notions of seed and soil fertility to wider concerns of overpopulation as they advanced down the road to the Green Revolution. Eugenic ideas of fertility regulation played an important role within the planning efforts of the agricultural scientists of the Rockefeller Foundation and the physicians of the Population Council as their operations in India commenced in the 1950s. Rockefeller's new Indian Agricultural Program (IAP), launched in 1956, immediately began work on improving South Asia's seed stocks in maize and sorghum and invested in the hybridization of American and Asian grain varieties to promote better growth. In turn, rural extension work and nutritional research assumed subsidiary roles within efforts to

improve South Asian grain yields and to restrict human fertility. Tensions subsequently emerged between these sciences, as well between scientists and administrators countering a perceived dual crisis of food shortage and overpopulation. Rockefeller's top officials and strategists, interpreted India's ascendant community development and rural extension initiatives with skepticism. In their view, neither food shortage nor overpopulation could be satisfactorily addressed through complex and often expensive social restructuring programs. Only unprecedented innovations in the agricultural sciences could provide the tools necessary to rectify the underlying imbalance between population growth and food production. Yet, Rockefeller-funded organizations pursued social interventions of a different, more invasive sort into the early 1960s. The new emphasis on the agricultural sciences in India represented a social experiment itself, transplanting the model that had successfully increased Mexican grain yields into a much larger national context. Further, the Population Council supported projects aimed at rural fertility restriction, but camouflaged as simple demographic research. This chapter shows that in both cases, the Population Council and the Rockefeller Foundation worked closely with Indian scientific institutions and the Government of India to pursue two rural agendas influenced by eugenic thinking — one to restrict human fertility, the other to augment the fertility of crop plants.

The fifth chapter, "Pursuing Permanent Growth," examines efforts undertaken by the Government of India, the Rockefeller Foundation, and the World Bank to cement structural changes within the agricultural sector. First, it examines hydro-politics in post-Partition Punjab through the Indo-Pakistani water resource disputes of the 1950s and the negotiation of the Indus Waters Treaty of 1960 by the World Bank. I argue that World Bank economists and hydrological experts focused their efforts on creating a permanent settlement of water rights in the Indus River Basin focused upon the prospect of restoring and increasing the region's agricultural productivity. As such, their work involved

investigations of the soil quality of the divided Punjab and whether the region's farmlands were exhausted and hence, infertile. These concerns played a central role in the negotiations between India and Pakistan that resulted in the final treaty, which has now governed water rights between the two nations for over half a century. Just as World Bank officials attended to the productivity of north India's farmlands, the Rockefeller Foundation collaborated with the Indian Council of Agricultural Research (ICAR) in promoting the expanded use of chemical fertilizers by cultivators. Working the IARI, the Rockefeller Foundation invested in tests of high-yielding wheat varieties at experiment stations across Punjab. At the same time, the foundation also assumed a powerful role in its work with the IARI and advocated vigorously for the establishment of graduate programs in the agricultural sciences, most notably the Punjab Agricultural University in Ludhiana. These institutions established on the model of the land-grant universities of the United States generated successive cohorts of agricultural experts to attend to the demands of modernized and capital-intensive farming for decades to come. In this way, these global institutions coordinated with the Indian and Pakistani states to create a permanent system governing the water supply, reverse the ravages of soil exhaustion, and ensure that increases in the productivity — and profitability — of Indian agriculture would be permanently sustained. Only after the inauguration of these efforts in radically restructuring South Asia's agricultural economy did the Rockefeller Foundation's IAP begin dedicated efforts to improve the yields of the most widely-consumed food grains across the subcontinent: wheat and rice.

Chapter One: Confronting the 'Double Crisis'

Less than three years after Partition, Dr. Wallace Ruddell Aykroyd introduced himself to a national audience in a broadcast carried by All India Radio on March 8, 1950. As head of the new nutritional division of the Food and Agriculture Organization of the United Nations (FAO), the fifty-year-old Anglo-Irish scientist described his long professional connection to India. From 1935 to 1945, he had directed the Nutrition Research Laboratories at Coonoor. Aykroyd also noted that he had helped to prepare the final report of the commission that investigated the Bengal Famine of 1943-44 that had left upwards of three million dead. His work on that report, he added, resulted in measures for improving nutritional standards throughout India. With his listeners across the subcontinent now apprised of his credentials, Aykroyd addressed the related problems of food shortage and malnutrition facing the young nation and much of Asia:

> It is in South and East Asia that such problems are most formidable. They differ, of course, from country to country. In India and China, for example, the question of obtaining enough food to meet the needs of the population is of primary importance. "Enough food" takes precedence over the "right kind of food."[72]

Critiquing the disconnect between efforts to produce more food and policies to improve nutritional health, Aykroyd further emphasized that deficient diets caused by food shortages contributed directly to persistent malnutrition. By the same token, improvements within the nutritional sciences could enable nations to maximize limited food supplies. Yet only by enlarging food supplies could independent India truly escape the lingering specter of famine. As Aykroyd observed: "That can be achieved only through such means as extended irrigation, the greater use of fertilizers, the introduction of high-yielding strains,

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[72] "Broadcast Talk on Malnutrition," March 8, 1950, Speeches, Statements, Radio and Television Broadcasts by Dr. W. R. Aykroyd, Series H1, RG 57.1, Nutrition Division (NUT), Archives of the Food and Agriculture Organization of the United Nations (FAO).

the elimination of pests and parasites, and numerous other methods."[73] He stressed, however, that there was reason to believe that India could accomplish that goal.

Aykroyd explained that, in the chaos of the Second World War, the Food and Agriculture Organization of the United Nations (FAO) had risen to coordinate global efforts to combat malnutrition and disease on multiple fronts. To that end, the FAO and other UN agencies would train regional specialists to attack the problem of hunger at the local level. Formed in 1943 at an international conference of economists, scientists, and diplomats at Hot Springs, Virginia, the FAO built upon the expertise and institutional framework developed by the International Institute of Agriculture (IIA).[74] Under the leadership of reputed British physician John Boyd Orr, a detailed mapping of the world food situation had formed its initial task.[75] Now, in the midst of the first wave of decolonization, Aykroyd told his Indian radio listeners that the recently-launched U.S. Technical Assistance Program would expand the FAO's work into nutritional and agricultural research and training.[76] Familiarly known as the Point Four Program owing to its roots in U.S. President Harry S. Truman's 1949 inaugural address, this ambitious though amorphous American initiative offered scientific funding and technical expertise "for the improvement and growth of the underdeveloped areas."[77] Coming in the early years of the

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[73] Ibid.

[74] The IIA had been established in 1905 through the lobbying efforts of the Polish-born California fruit merchant David Lubin. With initial support from King Victor Emmanuel III of Italy, the IIA served as the chief international repository for agricultural data from its headquarters in Rome for four decades. It worked closely with the League of Nations through the interwar years. Also headquartered in Rome at a newly-designed office complex between Circus Maximus and the Baths of Caracalla, the FAO would inherit a number of the IIA's agricultural data experts following the Second World War along with its extensive library. Asher Hobson, *The International Institute of Agriculture: An Historical and Critical Analysis of Its Organization, Activities, and Policies of Administration* (Berkeley, CA: University of California Press, 1931), 6-7.

[75] Bashford, 267-273.

[76] "Broadcast Talk on Malnutrition," March 8, 1950, Speeches, Statements, Radio and Television Broadcasts by Dr. W. R. Aykroyd, Series H1, RG 57.1, NUT, FAO.

[77] "Inaugural Address," 1949, Public Papers of Harry S. Truman, No. 19, Harry S. Truman Library & Museum, accessed September 2, 2016, https://www.trumanlibrary.org/whistlestop/

Cold War, the Point Four Program also paved the way for American philanthropies to launch their own public health and agricultural development projects across Latin America, Africa, and Asia.[78] It remained to be seen exactly how the populations of new nations like India, Pakistan, and Ceylon would fare under these broad new plans to improve the human condition.

This chapter tracks the impetus for increased food production in India as it evolved from the work of agricultural scientists and physicians in the late colonial period to shape the agendas of the philanthropic organizations and new international agencies that entered India following the Second World War. As will be shown here, the American philanthropic push to expand South Asia's food supply emerged from late colonial ideas regarding the causes of famine and malnutrition, as well as the efforts of Christian missionaries and imperial economic botanists to reshape agricultural and nutritional education and research across South Asia. Following the Second World War, these efforts intersected with rising fears of overpopulation in the decolonizing world. The urgency of this double crisis of food shortage and population growth, along with tensions between the nutritional and agricultural sciences, framed the efforts of the Rockefeller and Ford foundations and the agencies of the United Nations in their initial development interventions across the subcontinent.

OF MISSIONARIES AND MILLIONAIRES

Born in Manchester, England on October 27, 1874, Sam Higginbottom saw his family slip from relative prosperity to the brink of poverty before he had reached

50yr_archive/inaugural20jan1949.htm.

[78] Thomas G. Paterson, "Foreign Aid under Wraps: The Point Four Program," *The Wisconsin Magazine of History* 56, no. 2 (1972): 119-122.

adolescence.[79] This early experience of hardship pushed him toward the Christian notion of becoming "a living sacrifice" for God and kindled a deep interest in the teachings of American evangelist Dwight Moody who preached across the British Isles during the 1890s. By August 1894, the nineteen-year-old Higginbottom had scrounged up enough money to sail for Boston from Liverpool to enroll at Moody's Mount Hermon School in Northfield, Massachusetts.[80] The young Englishman's time at Mount Hermon sent him down a path toward scholarships at Amherst and Princeton, where he considered joining the seminary and studied jurisprudence under Woodrow Wilson, all the while working with the Board of Foreign Missionaries of the Presbyterian Church.[81] Through that organization, Higginbottom developed a close relationship with Lindus Cody of the Gospel Church of Cleveland, Ohio. Cody possessed both the Christian zeal and the small fortune needed to send the twenty-eight-year-old Princeton graduate abroad as a missionary to British India in 1903.[82]

Upon arrival in India, Higginbottom took up a placement as an instructor of economics and biology at the Presbyterian Mission's new Allahabad Christian College. Though still ambitious to work directly in converting the people of India to Christianity, he reluctantly accepted his teaching assignment as the will of God. Two years later, Higginbottom was joined by his patron's daughter Ethelind Cody, whom he married. Around the same time, he developed an interest in the agricultural economy of the surrounding countryside of the United Provinces and determined that inadequate training in the agricultural sciences kept farmers' yields low and the potential for famine high. He

79 Gary R. Hess, *Sam Higginbottom of Allahabad: Pioneer of Point Four to India* (Charlottesville: The University Press of Virginia, 1967), 2.
80 Ibid., 3-4.
81 Ibid., 6.
82 Sam Higginbottom, *The Gospel and the Plow* (New York: The Macmillan Company, 1926), 57.

was frustrated that neither the Government of India nor the Christian missions seemed dedicated to improving agricultural methods. As Higginbottom concluded:

> In view of the present condition in India and the great need for more food and education, surely, if Government and missions are justified in carrying on any kind of education, establishing that kind of education which most directly meets the needs of the great majority of the people of India.[83]

To that end, Higginbottom would work over the next two decades to develop an independent Department of Agriculture at the Allahabad Christian College, focused on training both Indian farmers and European and American missionaries in scientific farming methods.[84] To support his project, he returned to the United States periodically, completing his training in agricultural science at Ohio State University in 1909. During his stay in the United States, the crisply-dressed Higginbottom spoke to congregations and audiences about his Presbyterian mission work and his plans for reshaping Indian agriculture. More importantly, he also began to lobby American philanthropies and Christian organizations for donations through the 1910s, amassing more than $100,000 for his missionary work in Indian agriculture.[85]

Chief among the targets of Higginbottom's persistent and effective solicitation was John D. Rockefeller, Jr., chair of the Rockefeller Foundation established in 1913 with an endowment from his father's Standard Oil fortune.[86] In addition to a fortune, the younger Rockefeller had also inherited his father's religiosity, with both active members of the Northern Baptist Church throughout their lives.[87] In the United States, Europe, and China, the early Rockefeller Foundation focused on funding medical research and public health

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[83] Hess, 10-11.
[84] The Allahabad Christian College was renamed the Ewing Christian College in 1912 after the death of its founder, Arthur Henry Ewing. It continues to operate in India today under the latter name.
[85] Hess, 26.
86 Edward H. Berman, *The Ideology of Philanthropy: The Influence of the Carnegie, Ford, and Rockefeller Foundations on American Foreign Policy* (Albany: State University of New York Press, 1983), 24.
[87] Ron Chernow, *Titan: The Life of John D. Rockefeller, Sr.* (New York: Warner Books, 1999), 52.

intervention. That said, a subsidiary organization, the General Education Board (GEB), operated across the American South under the initial leadership of Seaman Asahel Knapp who championed farm demonstration methods to relay new developments in agricultural science to farmers.[88] Though active in preventive work on hookworm disease and malaria in India from 1920 onward, the Rockefeller Foundation would not establish a permanent office in New Delhi until 1935 and, even then, its focus remained exclusively on medicine and public health. By and large, the foundation operated as a grant-making institution for public health institutions in India prior to Britain's withdrawal in 1947.[89] Beginning in 1915, however, the missionary Higginbottom's contact with the Rockefeller Foundation would inform its assumptions about and frame its later interventions in Indian agriculture.

Higginbottom's long correspondence with John D. Rockefeller, Jr., for instance, set the stage for the foundation's first abortive foray into the agricultural sciences in India in early 1915. Submitting a grant request to the Rockefeller Foundation for a demonstration farm adjacent to the recently-renamed Ewing Christian College, Higginbottom's proposed experiment in agricultural education would involve "teaching scientific, modern farming as a missionary method."[90] In particular, his newly-formed Department of Agriculture, an independently-managed offshoot of the main missionary college, would take the "very poor and difficult to cultivate land" on the hills above the Yamuna River and convert it into a productive example of Western agricultural methods.[91] For the missionary Higginbottom, the infertile soil there would help to underscore exactly what American tractors, fertilizers, and seed varieties could do for Indian fields. Further, the proximity of the demonstration farm to the site of the Kumbh Mela pilgrimage at the confluence of the Yamuna and the

[88] Waterhouse, 34-36.
[89] Gary R. Hess, "American Philanthropic Foundations in India," in Hewa and Stapleton, 55.
[90] Higginbottom, 58.
[91] Ibid., 60.

Ganges would help to transmit the image of the productive farmlands to millions of Hindu pilgrims.[92]

In his correspondence, Higginbottom enthusiastically told representatives of the Rockefeller Foundation and the GEB that he took the work of the latter institution as the inspiration for his emerging farm demonstration project at Allahabad. Indeed, Higginbottom wrote to Wallace Buttrick, the secretary of the GEB in New York, in November 1915, to say that he was "praying that the day may soon come when you can send a man like Dr. [Seaman] Knapp to us to investigate and work out for India in similar fashion to what was done in the Southern United States."[93] He further explained that he had shared the reports of the GEB with British officials in the United Provinces who were supportive of his blend of missionary work and agricultural development. As he wrote: "When the British official in charge of the district […] read of what had been done in the southern states of America by the Rockefeller Foundation […] he arranged that every school should have a fenced-in school garden."[94] Through 1915, Buttrick received similar reports from Higginbottom, sharing many of the missionary's letters with an interested John D. Rockefeller, Jr. For his part, Rockefeller told Buttrick that he was impressed with the broad impact of the reports of the GEB, reaching as far as Higginbottom's mission in Allahabad.[95]

Despite Higginbottom's enthusiasm for the GEB's work and his own ambitious agricultural research institution taking shape in the hills outside Allahabad, the Rockefeller Foundation's board of trustees declined to fund Higginbottom's application on May 26,

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[92] Ibid., 61.
[93] Sam Higginbottom to Wallace Buttrick, November 29, 1915, Folder 2014, Box 209, Subseries 1.2, Series 01, General Education Board Records (GEB), RAC.
[94] Ibid.
[95] John D. Rockefeller, Jr. to Wallace Buttrick, May 6, 1915, Folder 2014, Box 209, Subseries 1.2, Series 01, General Education Board Records (GEB), RAC.

1915. This rejection came, however, with a caveat. The board resolved to "keep in view the close relation between the agricultural, industrial, educational, and health betterment of the tropical countries" and maintain regular correspondence with Higginbottom in Allahabad.[96] This seemingly preferential treatment on the part of the Rockefeller Foundation would enable Higginbottom to sustain the interest, if not the direct investment, of the organization over the course of two decades. In this way, Higginbottom's proposal had piqued the foundation's philanthropic interest in Indian agriculture. Less than a year later, John D. Rockefeller, Jr. himself wrote to Higginbottom of the board's plans for a survey of agricultural conditions in India to ascertain the "full knowledge of the facts."[97] True to their promise, the board authorized a survey of the subcontinent's agricultural and nutritional problems in June 1916, contingent upon the approval of British colonial officials.

Organized by trustee Jerome D. Greene and Wickliffe Rose of the GEB, the survey committee would travel to India to investigate the potential for the "adaptation to India of general principles of agricultural demonstration."[98] Whether the Government of India would have consented to Rockefeller's first inquiry into Indian agricultural conditions remains unclear as the foundation abruptly cancelled its plans in October 1916, owing to war conditions.[99] Nevertheless, the proposal had planted Higginbottom and the recently-rechristened Allahabad Agricultural Institute firmly on the Rockefeller Foundation's

96 "Minutes of Rockefeller Foundation Board Meeting," June 22, 1915, p. 10, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, Rockefeller Foundation records (RF), Rockefeller Archive Center (RAC).
97 John D. Rockefeller, Jr. to Sam Higginbottom, April 19, 1916, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
98 Jerome D. Greene to Wickliffe Rose, April 14, 1916, p. 1, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
99 Jerome D. Green to R. K. Das, October 18, 1916, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.

map.[100] During the war and through the food emergency that swept India in its aftermath, Higginbottom regularly requested funds from the foundation to support his agricultural education programs, but did not receive formal support owing to Rockefeller's focus on public health issues and continuing lack of an organizational structure in India.

At the same time, John D. Rockefeller, Jr. met personally with Higginbottom at his New York office in 1920 and pledged $50,000 of his own money for the purchase of land and buildings in Allahabad for the expansion of the institute.[101] In January 1921, Rockefeller revisited the possibility of adjusting his foundation's work in India to accommodate agricultural research. The foundation's secretary reported that Higginbottom's requests over the past five years had centered on proposals to investigate higher crop yields at the Allahabad institute, to create a replicable model of farm demonstration work for India, and to support relief work in response to the "emergency situation created by the famine of 1918-19."[102] Once again, however, Rockefeller's board of trustees hesitated to formally support Higginbottom's work. This reluctance stemmed, not from the nature of Higginbottom's missionary efforts or British opposition to such philanthropy, but rather from Rockefeller's own concerns over diverting resources from its nascent public health initiatives in British India.[103]

Despite his failure to convince the Rockefeller Foundation's board to finance an immediate venture into Indian agriculture, Higginbottom continued to expand the Allahabad Agricultural Institute through the interwar years. He wrote and spoke extensively in the United States on what he believed to be the social causes of India's low

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[100] Hess, 44. The Institute continues to operate in Uttar Pradesh today as the Sam Higginbottom University of Agriculture, Technology, and Sciences.
101 Ibid., 50.
102 Edwin R. Embree to John D. Rockefeller, Jr., January 13, 1921, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[103] "Memorandum by Dr. Heiser re: Conference with Dr. Jacocks," February 17, 1932, p. 3-4, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.

levels of agricultural production. In 1938, for instance, he wrote an article in the Christian missionary journal, *Women and Missions,* elaborating upon the ways in which he believed caste had affected rural life. As he noted:

> The village woman in general has been ascribed a very lowly position. Today she is the personification of the inferiority complex. It is difficult to arouse her to a sense of her own worth and importance. Not one percent of the village women of India are literate. Yet this inferiority-complex-ridden woman, illiterate, slave to her fears and superstitions, passes on to her children what she has.[104]

As such, Higginbottom noted that he had initiated a program at the Allahabad Agricultural Institute that focused on recruiting local Indians who had converted to Christianity to serve as liaisons to lower caste women, offering them courses in homemaking, sanitation, and nutrition. Patience was needed in converting these women into effective agents of change within their households, as "the village woman is as shy as a deer."[105] In addition to his attempts to address the plight of village women through instruction in homemaking, Higginbottom also challenged aspects of the caste system that he believed kept Indian farms inefficient. During a lecture at a conference of the Institute of Pacific Relations in 1942 in Quebec, for instance, the aging Higginbottom delivered a lively description of his efforts to push back against the caste system through the missionary zeal of the Allahabad Agricultural Institute. He argued that if Indian farmers were not "not handicapped by caste" then they could cultivate a wider variety of fruits and vegetables to supplement staple grains.[106] Through a rejection of a caste structure, they could also make more effective use of waste and dramatically improve soil fertility. The caste-bound farmer also found himself

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[104] Sam Higginbottom, "Help for India's Farmers," *Women and Missions* XV, no. 7 (1938): 221. in Box 10, Series I, Accession No. 5996-b, Additional Papers of Sam and Ethelind Cody Higginbottom, Small Special Collections Library, University of Virginia (UVA).
[105] Ibid.
[106] "'Help for India's Farmers,' by Sam Higginbottom," December 1942, p. 7, Box 10, Series I, Accession No. 5996-b, Additional Papers of Sam and Ethelind Cody Higginbottom, Small Special Collections Library, University of Virginia.

unable to "kill the pests which so greatly reduced his crop yields," Higginbottom argued.[107] In these ways, Higginbottom frequently cited Indian society — especially caste and gender dynamics — as the chief culprit behind the perceived backwardness of South Asian agriculture. His argument implied that while scientific agricultural methods could go so far in improving rural welfare, only a wider embrace of Christianity could enable the social change he believed India truly needed.

With Higginbottom's devoted fundraising efforts across North America and Europe, occasional support from the Government of India, and an income drawn from consulting work for the Maharajah of Gwalior, the Allahabad Agricultural Institute evolved into a major center for agricultural education and farm demonstration during the interwar years.[108] During that period, the institute continued the Ewing Christian School's practice of training missionaries from Europe and the United States to be dispatched across the subcontinent, though with extensive training in agricultural practices in addition to their knowledge of scripture. In this way, the Allahabad Agricultural Institute remained first and foremost a Christian mission, with agricultural development work and rural extension serving the deeper purpose of evangelization. In 1933, the American agronomist Arthur T. Mosher arrived in Allahabad, fresh from a master's degree in agricultural economics at the University of Iowa, though yet to complete his Ph.D. in economics at the University of Chicago under the supervision of economist Theodore Schultz.[109] Through his work as a missionary and agronomic specialist at Allahabad during the 1930s and 1940s, Mosher would rise within the ranks of the institute to become its main representative to the Rockefeller and Ford foundations after the Second World War as both organizations would

[107] Ibid.
[108] Hess, 88-90.
[109] Ibid., 91-92.

provide the Allahabad Agricultural Institute with direct financial support. As Higginbottom's successor at the helm of the Institute, Mosher would pioneer independent India's rural extension program during the 1950s, advocating for a more social scientific approach to reengineering rural society in the quest for greater agricultural productivity.[110] As will be seen in the next chapter, however, the agricultural education agenda of the Allahabad Agricultural Institute would prove nearly inseparable from its original purpose as a Christian mission.

A VAST UNDEVELOPED ESTATE

Though unique in India for its missionary focus on reshaping agricultural education with demonstration farms and training, the Allahabad Agricultural Institute was not alone in its pursuit of greater food production and improved nutritional outcomes in late colonial India. The Government of India's Board of Agriculture had commissioned a botanical survey of wheat varieties in the subcontinent in 1906, with the object of identifying varieties prime for improvement. [111] The survey helped to overturn the commonly-held scientific belief that Indian wheat varieties were of such poor quality that they were incapable of improvement. Through wheat research at the Imperial Agricultural Research Institute (IARI) at Pusa, Bihar, colonial botanists had identified the higher quality, high-yield Pusa 12, Pusa 4, and Punjab 11 varieties by 1912.[112] Once identified, the IARI worked to market these and other grain varieties to Indian farmers, emphasizing the need for varieties to be cultivated separately to increase yields.[113]

Albert Howard helped to spearhead these efforts in the improvement of wheat and rice varieties at Pusa as Imperial Economic Botanist to the Government of India from 1905

[110] Ibid., 88.
[111] Ibid., 101.
[112] Albert Howard, *Crop-Production in India* (London: Oxford University Press, 1924), 101.
[113] Ibid., 62.

to 1924. Born in Shropshire and educated at Cambridge, Howard worked with his wife, the plant physiologist Gabrielle Matthaei, to champion the early organic farming movement in India and Britain.[114] From Pusa, Howard and Matthaei published separately and jointly on their research into identifying and breeding disease-resistant wheat and vegetable strains.[115] A fellow of Newnham College, Cambridge, Matthaei worked extensively on crop improvement through over two decades at the IARI, co-authoring the comprehensive survey, *The Development of Indian Agriculture,* with her husband in 1927. In the book's preface, Howard and Matthaei observed that their efforts to identify and reproduce high-yield varieties of food grains and cash crops had been limited by colonial India's fragmented agricultural institutions. Indian agriculture, they wrote, now stood at a crossroads:

> On the one hand, a great step forward is possible, provided the various independent departments working in the villages can be welded together into a single efficient agency, dealing with rural India as a whole. On the other hand, very modest progress can be achieved with the present means. It is for India to decide by which of these two roads she intends to travel.[116]

For Matthaei and Howard, India represented "a vast undeveloped estate" in desperate need of a concerted program of rural reconstruction and mass agricultural education. Simple changes in the habits and methods of small cultivators advocated by such program could "at least double" Indian agricultural yields over the course of a few decades.[117] To that end, the economic botanists detailed the demonstration and training work of the Rockefeller-funded General Education Board (GEB) in the Southern United States as a model for South

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[114] Gregory Barton, "Sir Albert Howard and the Forestry Roots of the Organic Farming Movement," *Agricultural History* 75, no. 2 (2001): 268.
[115] As one example, see: G. L. C. Matthaei, "Experimental Researches on Vegetable Assimilation and Respiration," *Philosophical Transactions of the Royal Society of London* 2, no. 47 (1907): 48-105.
[116] Albert Howard and Gabrielle L. C. Howard, *The Development of Indian Agriculture* (London: Oxford University Press, 1927), i.
[117] Ibid., 84.

Asia.[118] Within India, beyond the work of the IARI, the British botanists specifically held up the work of Sam Higginbottom at Allahabad as a replicable model for agricultural experimentation and knowledge-sharing.[119] Rather than lamenting the prospect of famine, Matthaei and Howard believed that the duplication of experimental stations like the ones at Pusa and Allahabad, the extension of efficient farming methods, and the simple coordination of agricultural education across the subcontinent could amplify the seed, soil, and organic farming research they had advocated for years.[120]

Howard and Matthaei's investigations into high-yield, nutritious crop varieties paralleled Robert McCarrison's contemporaneous efforts in the nutritional sciences at Coonoor Research Laboratories in the Madras Presidency. Like Howard and Matthaei, McCarrison also helped to pioneer the early organic farming movement in India and Britain.[121] After Gabrielle's death in 1930 and his prompt marriage to Matthaei's younger sister, Louise, Howard's work through the 1930s and early 1940s focused on increasing crop yields through organic composting and improving soil fertility.[122] By emphasizing soil quality and, by extension, the operations of the entire farming enterprise, Howard aimed to maximize the nutritional quality of food grains and vegetables.[123] In much the same way, McCarrison gained influence within the organic farming movement through his work on identifying connections between soil quality, plant health, and the resulting nutritional value and vitamin content of foods.[124] In a 1936 lecture delivered to the Royal

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[118] Ibid., 60-63.
[119] Ibid., 29.
[120] Ibid., 85.
[121] C. Vogt, "Origins of Organic Farming," in William Lockeretz, ed. *Organic Farming: An International History* (Trowbridge: Cromwell Press, 2007), 24.
[122] Ibid.
[123] Albert Howard, *An Agricultural Testament* (London: Oxford University Press, 1943), 10.
[124] Robert McCarrison, *Nutrition and Health* (London: The McCarrison Society, 1953), 13-14.

Society of Arts in London, McCarrison defined nutrition in relation to soil quality and farming methods:

> Impoverishment of the soil leads to a whole tram of evils: pasture of poor quality; poor quality of the stock raised upon it; poor quality of the foodstuffs they provide for man; poor quality of the vegetable foods that he cultivates for himself; and faulty nutrition with resultant disease in both man and beast.[125]

In this way, farming methods and practices featured prominently in McCarrison's evolving thoughts on nutrition. Beyond using nutritional science as a tool for disease prevention and offering a "new measure of the 'value of food'," as Sunil Amrith has suggested, McCarrison's work traced nutrition back to soil health.[126] This aspect of McCarrison's thinking, in turn, represented a rising connection between nutritional science in its promotion of public health and agricultural science in its endeavor to increase food production. With a practical emphasis upon agricultural production and laboratory research into nutrition's role in human health, McCarrison urged the Government of India in 1927 to devote its attention to malnutrition as a major malady facing India's population.[127] In 1935, fresh from his assignment as Health Secretary of the League of Nations, Wallace R. Aykroyd arrived in India to take the helm of the Coonoor Nutrition Research Laboratories upon McCarrison's retirement.[128] In light of his pioneering role at the League of Nations, the British Nutrition Foundation later dubbed him the "first international nutrition worker".[129] In his time at Coonoor, Aykroyd would expand upon McCarrison's influential conception of malnutrition and clarify the critical connections between the nutritional and agricultural sciences.

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[125] Ibid., 14.
[126] Sunil Amrith, "Food and Welfare in India, C. 1900–1950," *Comparative Studies in Society and History* 50, no. 4 (2008): 1020.
[127] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India,": 19.
[128] Ibid.
[129] Aykroyd, i.

While Howard and McCarrison worked to forge connections between agricultural improvement efforts and nutritional research, colonial science experienced a shift back to the Malthusian pessimism that had dominated official thinking on famine through the late nineteenth and early twentieth centuries. Through the 1920s and 1930s, as David Arnold observes, colonial demographers and scientists expressed increasing concern regarding the gap between India's population growth and its food production capacity.[130] Indeed, even the usually optimistic Howard and Matthaei noted in familiar Malthusian terms that, "In many parts of the country the pressure of the population, both human and bovine, is intense and but for the high infant mortality and periodical waves of pestilence the position would become desperate."[131] Howard and Matthaei's concerns over the "pressure of the population" in India came just as the eugenics movement in North America was expressing similar concerns for the effect of growing populations upon the natural environment. As Alexandra Minna Stern has shown, eugenicists in the United States during the first decades of the twentieth century advocated for conservation and established overpopulation as a major threat not merely to humanity, but to the broader natural world. As she writes of these eugenicists:

> They turned toward neo-Malthusian arguments about zero population growth and pushed for immigration restriction and mandatory birth control, including the implementation of sterilization in less developed countries. Now the burden of saving nature was tied to the regulation of reproduction, child spacing and the adoption of the nuclear family model.[132]

For imperial agricultural scientists like Howard and Matthaei, the apparent abundance of the opening decades of the twentieth century and reduced mortality rates in India might have been positive for human society, but such developments also threatened to upend the

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[130] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India,"17.
[131] Howard and Howard, 22.
[132] Alexandra Minna Stern, *Eugenic Nation: Faults and Frontiers of Better Breeding in Modern America* (Berkeley, CA: University of California Press, 2016), 149.

natural balance upon which productive agriculture depended. These concerns over resource conservation that derived in part from eugenic thinking, would fuel emerging discussions of the prospect of family planning initiatives during the 1920s and 1930s.

Meanwhile, W. R. Aykroyd, in his new role as director of the Nutrition Research Laboratories at Coonoor, also reflected upon the apparently fading legacy of famine in late colonial India and its implications for population growth rates. In an unpublished paper, he stressed the need for the Government of India to reform the Famine Code that governed relief policies in times of food crisis. In particular, he believed that the practice of requiring labor from famine victims in return for aid should be abolished because such work-for-aid schemes were inhumane and inevitably proved financially inefficient in any case. Though he emphasized that standards of living across India remained so low as to leave millions susceptible to malnutrition, he remained hopeful that progress had been made in protecting large swathes of the population from famine through improved living standards.[133] As he wrote in 1941:

> The population […] appears to possess very scanty reserves to carry it through seasons of scarcity in which its resources are still further reduced. Nevertheless it may be that the present economic level of the people, low though it is, is higher than at any previous time in the history of India. There certainly appears to be some evidence that the power to resist famine conditions is increasing.[134]

From this standpoint, the long-term implications of India's advances in public health during the first decades of the twentieth century remained ambiguous for colonial scientists and physicians. Though India's interwar population growth to some extent testified to effective public health policy, Arnold cites India's population increase of 33 million in the decade following the First World War as "heralding the start of a Malthusian nightmare" for

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[133] "Unpublished paper entitled 'Famine' by W. R. Aykroyd," 1941, p. 25-26, W. R. Aykroyd: Notes and Comments, Series B1, RG 57.1, NUT, FAO.
[134] Ibid., 29.

colonial scientists across South Asia.[135] This nightmare would become all too real following the start of the Second World War and the return of mass starvation to India in Bengal in 1943.[136]

THE RETURN OF FAMINE AND WAR

In the midst of India's independence struggle and into the Second World War, scientific concerns regarding food shortage and overpopulation in South Asia continued to build. Wartime supply pressures and the Bengal Famine of 1943-1944 compounded these fears, paving the way for significant philanthropic investments in agricultural research and development in India, Pakistan, and Ceylon. Rockefeller Foundation officials nonetheless continued to agonize over their organization's relationship with colonial India's embattled regime. As Alan Gregg, the Harvard-trained physician who directed the foundation's Medical Sciences Division, wrote in early 1941:

> I've wondered whether we as Americans could do much effective work in India until they have solved their relations with the British. […] Whenever the British control is turned over to the Indians we can enter and on a very large scale. Until then we are either pro British or anti British in Indian eyes on the old "he that is not for me is against me" basis.[137]

Even in view of this tension over the lingering colonial administration, interest in expanding programming in India strengthened, particularly considering the turmoil in Europe and China, Rockefeller's two principal regions of operation.[138] Around the same time, Wilbur A. Sawyer, head of Rockefeller's International Health Division, reinforced the foundation's focus on hookworm disease and malaria control in South Asia.[139]

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[135] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India,"17.
[136] Amrith, "Food and Welfare in India, C. 1900–1950,"1025.
137 "Note from Alan Gregg," 1941, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[138] Waterhouse, 83-84.
[139] Ibid. India was by no means alone as a site of overseas medical intervention and scientific study on the part of the American Rockefeller Foundation. Rockefeller initiatives in the medical sciences proved extensive elsewhere around the world. In this regard, India was by no means unique. The Rockefeller

On August 21, 1941, Sawyer wrote to Dr. William P. Jacocks, the physician who had coordinated Rockefeller's hookworm eradication efforts in Ceylon during the 1920s and who now sought to expand all areas of programming as regional director for South Asia in New Delhi. Sawyer stressed that Rockefeller's attention in South Asia needed to remain limited to support of the All India Institute of Medical Sciences (AIIMS).[140] Even with new resources being shifted into India from China, the foundation's focus was to remain on medicine and public health. Despite his enthusiasm for expanding the foundation's scientific efforts in South Asia, Jacocks would soon be replaced in his role by the more restrained Marshall C. Balfour, the physician who would ultimately lead the Population Council's efforts in India during the 1950s.[141] Balfour's postwar work in family planning programming in India will be examined in Chapter Four. For the time being, however, the broader rural interventions encouraged by Sam Higginbottom and haltingly explored by top Rockefeller Foundation officials would not bear fruit. The connection between public health and agricultural improvement being forged by British scientists like Howard, Matthaei, and McCarrison simply could not overcome the American foundation's focus on its medical investments in Asia. Further, and perhaps more immediately, fears of overstepping bounds with the colonial administration limited any expansion. Yet, if the

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Foundation sponsored a wide array of forays into the prevention of yellow fever, malaria, and hookworm disease during the interwar years across Asia (particularly China), Latin America, Europe, Africa, and the Caribbean. The foundation's medical focus shifted somewhat due to the disruptions of the Second World War, with resources being pulled from Europe and China. Nevertheless, the institution remained involved in public health in other host nations. See, for instance, Steven Paul Palmer, *Launching Global Health: The Caribbean Odyssey of the Rockefeller Foudnation* (Ann Arbor, MI: University of Michigan Press, 2010); Anne-Emanuelle Birn, *Marriage of Convenience: Rockefeller International Health and Revolutionary Mexico* (Rochester, NY: University of Rochester Press, 2006); Mary Brown Bullock, *The Oil Prince's Legacy: Rockefeller Philanthropy in China* (Washington, DC: Woodrow Wilson Center Press, 2011); and John Ettling, *The Germ of Laziness: Rockefeller Philanthropy and Public Health in the New South* (Cambridge, MA: Harvard University Press, 1981).

[140] W. A. Sawyer to W. P. Jacocks, August 21, 1941, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.

[141] Ibid.

foundation's entry into rural development and agricultural science in South Asia had been slowed by concerns over programmatic focus and tensions with the British administration, it was postponed indefinitely by the start of war in the Pacific in December 1941.

With the outbreak of war, the wheels of colonial officialdom ground into action. The Government of India launched an ad hoc program of agricultural development to compensate for diminished rice supplies following the Japanese invasion of Burma. The Grow More Food Campaign marked both a culmination of prior efforts to stimulate food production in the subcontinent and a marker of the weakness of colonial economic policy.[142] Inaugurated by the Government of India's Foodgrains Policy Committee in 1942, the campaign sought to increase India's food acreage by about seven million acres, or four per cent, to achieve a target of 1,700,000 tons more food. This relatively modest goal was to be achieved by bringing new land under cultivation, doubling the crop cycle, and reallocating land under cash crops for growing food grains. Further, the Government of India had promised to increase the water supply by constructing new wells and canals, promoting the use of fertilizers, and distributing improved seed varieties such as those developed at Pusa earlier in the century. [143] The colonial government's Grow More Food Campaign would run for five years, only to be succeeded by a series of limited initiatives under the same banner in the years following independence.

Reflecting on the colonial era Grow More Food campaign from Beirut while coordinating relief efforts for Arab refugees in 1954, Henry Knight described the program

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[142] Henry Knight, *Food Administration in India, 1939-47* (Stanford, CA: Stanford University Press, 1954),122. A career officer in the Indian Civil Service (ICS), Knight served as acting governor of both Bombay and Madras, Burma, and Assam during the war years. Most pertinent to his expert analysis of the Grow More Food Campaign, Knight also held the post of Adviser to the Governor of Bombay for finance, food, agriculture, and rural development from 1939 to 1945.
[143] Ibid., 123.

as having achieved as much as could be expected under wartime conditions.[144] The Famine Inquiry Commission proved somewhat less sympathetic to the progress of Grow More Food than Knight. Tasked with assessing the causes of the 1943-44 Bengal Famine, the Commission went well beyond its remit in its final report, offering a broad survey of India's food and demographic situation during the war years.[145] With W. R. Aykroyd of the Nutrition Research Laboratories at Coonoor tasked with large portions of the writing, the report also placed a strong emphasis on the long-running problems of malnutrition. concluding: "The results achieved by the campaign have not been spectacular. This is not surprising."[146] The Commission went on to explain that one of the major obstacles encountered by the campaign had been a lack of coordination between the various provincial governments and the central administration. Additionally, the Government of India had done little to assuage the fears of farmers regarding the potential negative effects of greater food supplies upon prices.[147] As they noted:

> A large increase in agricultural production in India by extension of the area of cultivated land and the improvement in the yield of crops through irrigation and other measures will not be achieved without intensive and sustained effort on the part of both Government and the people. There is, therefore need for laying down a clear agricultural policy and providing administrative machinery for its execution.[148]

All told, the Grow More Food Campaign of the final years of the British Raj did increase the strict amount of land under food grain cultivation. It may even have modestly improved grain production in India, but as Knight readily admitted, the data collected was so poor as

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[144] Ibid., 126.
[145] *Final Report of the Famine Inquiry Commission*, iii. The Famine Inquiry Commission was chaired by Sir John Woodhead and consisted of S. V. Ramamurty, Manilal B. Nanavati, Afzal Husain, and W. R. Aykroyd.
[146] Ibid., 24
[147] Knight, 145.
[148] *Final Report of the Famine Inquiry Commission*, 24.

to render statistical interpretation quite difficult.[149] That said, and as the Famine Inquiry Commission emphasized, food grains alone would do little to combat malnutrition if protein and vitamin-rich foods were not mixed in to enable a balanced diet.[150]

Turning to the short-run causes of the Bengal Famine itself, the Commission observed that the larger part of the population of Bengal "did not suffer from a lack of food in 1943."[151] Indeed, the major cause of the famine lay in rising prices brought about by rice trade disruptions associated with the fall of Burma; about ten per cent of the population had been effectively priced out of food purchasing by the resulting inflation, speculation, and hoarding.[152] As Indian economist P. C. Bansil concluded in his 1958 critical work, *India's Food Resources and Population:* "There is nothing to show that food supplies in India or even in Bengal itself were short of the average during the last few years."[153] In part, Bansil cited the findings of the Famine Inquiry Commission as evidence of the "untenable" nature of Malthusian thinking regarding food shortage and overpopulation in India.[154] The debate over the causes of the Bengal Famine would subsequently spur a considerable discussion surrounding economist Amartya Sen's 1981 work on the subject, in which he contended that mass starvation resulted from the failure of the "entitlement system" — namely, the rules surrounding the acquisition and exchange of property— and not a strict food shortage.[155]

In assessing long-term population trends across British India, the Famine Inquiry Commission judged that, at more than 400 million people, South Asia was overpopulated.

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[149] Knight, 142.
[150] *Final Report of the Famine Inquiry Commission*, 24.
[151] Ibid., 32.
[152] Bansil, 32.
[153] Ibid., 31.
[154] Ibid., 1.
[155] Sen, 1-8.

That said, the problem did not lie in sheer overpopulation or even in the limitations of India's resource potential. Rather, the Commission concluded: "While we hold that there is a serious population situation, we emphasize throughout that the *primary* problem is that of under-development of resources, both agricultural and industrial, in a wide sense of the term."[156] The Commission went on specifically to reject dismal Malthusian explanations for the crisis, contending that future famines could be avoided by "the intensive development of all resources." In this way, underdevelopment, and not simply overpopulation, had provided the conditions for famine. Nevertheless, the Commission conceded that a decrease in the population growth rate was "not only desirable but necessary" and recommended the creation of a board of statistical experts to investigate the possibilities of emigration, urbanization, and family limitation.[157]

In conjunction with the publication of the final report of the Famine Inquiry Commission, Aykroyd also submitted his own commentary on India's postwar welfare just before he resigned from his post at Coonoor to become the first director of the FAO's Nutrition Division in December 1944. In his "Note on Food and Nutrition Policy in India," published in 1945, Aykroyd wrote that, in light of the crisis in Bengal and eastern India, the issue of nutrition had finally come to the attention of the public at-large as a major cause of persistent ill-health.[158] The Government of India, he argued, should not waste the opportunity to make significant improvements in nutritional policy. First, Aykroyd noted that new public interest had emerged in "protective" foods, such as pulses and milk that could provide the proteins in which cereal crops were deficient. He urged the government to increase the production of these foods and refrain from the "mere propaganda" in which

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[156] *Final Report of the Famine Inquiry Commission*, 73.
[157] Ibid., 103.
[158] W. R. Aykroyd, *Note on Food and Nutrition Policy in India* (New Delhi: Government of India Press, 1945), 1.

it had previously indulged. As he wrote: "There is no need for 'Drink More Milk' campaigns to popularise milk. Milk is in fact a rare and precious fluid which everybody tries to obtain if he can."[159] Instead of another publicity pitch, Aykroyd pressed for serious investments in greater and more equitable food production. He further emphasized that campaigns to support nutritional education (particularly among India's women), consumer research, and school-feeding programs would prove essential over the coming years. Finally, Aykroyd stressed the need for the training of more nutrition researchers and scientists in India. Echoing the complaints articulated by Albert Howard and Gabrielle Matthaei nearly two decades earlier, he claimed that nutritional sciences in British India lacked both a coordinated structure and sustained investment in research.[160] With that, Aykroyd left New Delhi for Washington, D.C., where he would help to shape a new international institution tasked with achieving similar goals for the entire postwar world. At the helm of the FAO's Nutrition Division through the 1950s, he would also figure prominently in the debate concerning the relationship between food shortage and overpopulation that would shape an emerging international development paradigm.

FRAMING INTERNATIONAL DEVELOPMENT

Following the Second World War and at the height of the Indian independence movement, South Asia increasingly drew the attention of American philanthropic relief institutions, as well as the rising international development organizations championed by the United States. This growing interest would help to clarify the relationship between the nutritional and agricultural sciences in their pursuit of development through human welfare promotion. W. R. Aykroyd explained this in his "Note on Food and Nutrition Policy in India":

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[159] Ibid., 2.
[160] Ibid., 10.

> To-day, as the result of the stimulus given by the Hot Springs Conference, and, it may be added, because of the steady and persistent pressure on the part of nutrition workers in India, the agricultural authorities have become 'nutrition-minded'. They have realized the need for planned production based on a scientific assessment of nutritional needs.[161]

In this way, the launch of the FAO opened an opportunity for closer collaboration between the rising fields of agricultural and nutritional science. Building on the colonial expertise of physicians like John Boyd Orr, Robert McCarrison, and, most recently, Aykroyd himself, the FAO sought to bridge the gap between two discrete fields of scientific inquiry.[162] That said, while the FAO would be well-equipped as a coordinating network for scientific inquiry and data-driven discussion around the world, it would never truly wield the resources necessary to launch the direct interventions undertaken by private American philanthropies.[163]

As the FAO found its footing in Washington and then Rome following the war, American humanitarian attention to India's nutritional situation increased in the wake of the Bengal Famine. This new focus continued after the end of the Second World War and would set the stage for more geopolitically-motivated concerns after the start of the Cold War. An early example of this growing American interest in delivering aid to a hungry India came in the form of a pamphlet entitled *India's Hunger,* written by University of Chicago economist and FAO consultant Theodore W. Schultz. With a foreword penned by Pearl S. Buck, the Nobel Prize-winning author and daughter of missionaries whose work detailed peasant life in China, the pamphlet represented the summary version of the report of the American Famine Mission to India. Indeed, Buck herself had commissioned the report as chair of the India Famine Emergency Committee, a group of thirteen scholars, public servants, and scientists, including diplomat Sumner Welles, NAACP head Walter

[161] W. R. Aykroyd. "Note on Food and Nutrition Policy in India," 2-3.
[162] Ibid.
[163] Bashford, 271.

White, and Albert Einstein. The group's stated aim was to ensure that the maximum amount of America's surplus food reached the hungry of the world and that India received "an equitable share."[164]

On March 20, 1946, Hazel Whitman of the India Famine Emergency Committee wrote to W. R. Aykroyd in his new role as director of the Nutrition Division of the FAO, then still headquartered in Washington. Whitman explained that, under the direction of Pearl Buck, the committee planned to launch a nationwide food drive for India that would encourage "American housewives to make up a package and send it themselves."[165] To that end, she asked that Aykroyd visit her and Buck in New York so that he might help to compile "a list that housewives may easily purchase or find on their own kitchen shelves."[166] To some extent, this seemingly ad hoc plan harkened back to previous American relief efforts, such as the individual aid packages for Belgium encouraged by Herbert Hoover during the First World War.[167] Ever practical-minded, however, Aykroyd delicately rejected the idea of shipping thousands of individually-wrapped packages of American pantry surplus to India via airmail: "Food parcels generously donated by American housewives could not be very appreciable in quantity, in relation to India's needs."[168] Instead, he outlined India's actual food supply needs: significant amounts of bulk grain and not haphazardly compiled packages. That said, he stressed that Indians

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[164] "India's Hunger: The Report of the Famine Mission to India," 1946, p. 2, Theodore W. Schultz Collection, MA 22, South Dakota State University Archives and Special Collections, Hilton M. Briggs Library, Brookings, South Dakota.
[165] Hazel Whitman to W. R. Aykroyd, March 20, 1946, W. R. Aykroyd: Incoming Letters (1941-1947), Series B1, RG 57.1, NUT, FAO.
[166] Ibid.
[167] Glen S. Jeansonne, "Hoover Goes to Belgium," *History Today* 65, no. 1 (2015): 23.
[168] W. R. Aykroyd to Hazel Whitman, March 26, 1946. W. R. Aykroyd: Outgoing Correspondence (1941-1947), Series B1, RG 57.1, NUT, FAO.

needed to diversify their diets to include protein and vitamin rich foods that would help stave off malnutrition.[169]

As M. Srinivas Chary has shown, near-famine conditions across India in the aftermath of the Second World War drove lobbying efforts aimed at persuading the Truman Administration to extend food relief efforts to British India just as it had offered aid to the war-torn regions of Europe and East Asia.[170] In his writing on India's postwar food crisis, Schultz, who had supervised Sam Higginbottom's protégé Arthur T. Mosher in his doctoral work at Chicago, argued that British India needed about 750,000 tons of grains directly from the United States if it was to stabilize rising domestic food prices.[171] Schultz also emphasized that, while compounded by the chaos of war, the current precarious food situation had been caused in part by the inefficiencies of the village-based, subsistence-level agriculture. Further, Schultz condemned the ineffectiveness of India's colonial administration in coordinating food production and price stabilization efforts across the country — failures which he contended had directly precipitated the famine of 1943-44.[172]

Now, in 1946, Schultz wrote in the American Famine Mission to India's report that continuing crisis in South Asia left "opportunities for private relief agencies to assist in India's food emergency."[173] He outlined three specific actions that could be supported to remedy both the immediate crisis and the long-term food situation. First, American organizations should enable the shipment of "supplementary food items," such as vitamin tablets, cod liver oil, and dried milk in small tins. Second, American organizations should coordinate the "development of scientific programs and demonstrations of improved

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[169] Ibid.
[170] M. Srinivas Chary, *The Eagle and the Peacock: U.S. Foreign Policy toward India since Independence* (Westport, CT: Greenwood Press, 1995), 28.
[171] "India's Hunger: The Report of the Famine Mission to India," p. 18, Theodore W. Schultz Collection.
[172] Ibid.
[173] Ibid.

methods" of using substitute foods to fight malnutrition. Finally, the American public and humanitarian organizations ought to advocate for "improved methods of agriculture within the limits imposed by average Indian farm conditions."[174] In this way, Schultz called for humanitarian intervention that would promote the same package of reforms that colonial nutritional and agricultural scientists had advocated for decades.

Meanwhile, for the young FAO, the institutional planning process largely involved determining what areas of work would be feasible given the organization's broad mandate and limited resources. Given the relatively short history of nutritional science as a coherent field of experimental research, the FAO's postwar planning phase also involved identifying topics and areas in which quality studies had already been conducted. On January 30, 1947, for instance, Aykroyd wrote tersely to Boyd Orr concerning the latter's upcoming planning meeting with Julian Huxley, the biologist, eugenicist, and founding director of UNESCO: "It is pointed out that India offers remarkable opportunities for research on nutrition and deficiency diseases. This point is not referred to in the UNESCO resolution."[175] Over the first years of the FAO's work, Aykroyd would consistently remind his colleagues of the existing work of the Nutrition Research Laboratories at Coonoor. As will be shown in the next chapter, over his fourteen years directing the Nutrition Division, he would significantly promote South Asia as a prime venue in which the FAO could support further nutritional research.

Aykroyd's early work at the FAO also involved visits to Latin America, East Asia, and North Africa to determine how the Nutrition Division's work might more seamlessly intersect with on-going efforts in the agricultural sciences and public health. In the first

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[174] Ibid.

[175] "Memo from W. R. Aykroyd to Director John Boyd Orr," January 30, 1947, Memoranda by Dr. W. R. Aykroyd to DG and DDG, Series C4, RG 57.4, NUT, FAO.

months of 1950, for instance, Aykroyd visited Sindabis, the center of the International Health Division of the Rockefeller Foundation's health demonstration work in Egypt's Nile River Delta, to determine how the FAO's Nutrition Division might collaborate with Rockefeller in the region.[176] Joined by colleagues from UNESCO and the World Health Organization (WHO), Aykroyd complimented the International Health Division's (IHD) long experience in demonstration work and noted the organization's willingness to introduce new methods of public health promotion "such as the use of DDT."[177] As Aykroyd noted, Rockefeller was eager to employ the technological developments of the preceding decade in its new pursuit of agricultural innovation.

In Mexico through the 1940s, successful projects in the agricultural sciences undertaken by the Rockefeller Foundation, particularly involving innovations in high-yield seed varieties, herbicides, pesticides, and fertilizers, prompted renewed debate over the foundation's role in South Asia following the war and in the run-up to independence.[178] Still, tensions lingered between the organization's commitments to public health — which extended lifespans, limited disease morbidity, and reduced childhood mortality — and new experiments in agricultural science that seemed to hold the key to vastly increased food production. As early as May 1947, Rockefeller representatives had begun to decline overtures from Indian public officials and scientists, such as statistician P. C. Mahalanobis, requesting that the Rockefeller Foundation expand its programming in India beyond the existing International Health Division, which still concentrated its efforts on distributing small grants and bringing the fruits of American and European biomedical research to

[176] "Memo from W. R. Aykroyd to the Acting Director-General," March 13, 1950, Memoranda by Dr. W. R. Aykroyd to DG and DDG, Series C4, RG 57.4, NUT, FAO.
[177] Ibid.
[178] Waterhouse, 136.

South Asia.[179] In the aftermath of Partition, however, Rockefeller Foundation officials began seriously to consider intervention on a much larger scale. The only remaining question would be whether the foundation would invest more deeply in public health or collaborate with new international organizations like the FAO and the rapidly-expanding Ford Foundation to translate knowledge drawn from the fields of Mexico into a wider agricultural development program for South Asia.

A STRATEGY OF PHILANTHROPIC INTERVENTION

At the first All-India Conference of the Family Planning Association in Bombay in November 1951, the Indian demographer and economist Sripati Chandrasekhar rose to deliver his inaugural address as president of the group. Having earned his Ph.D. in Sociology from NYU in 1944, Chandrasekhar would go on to work with Julian Huxley's UNESCO and serve as a controversial cabinet minister under Indira Gandhi.[180] Addressing India's food production capabilities, Chandrasekhar began:

> Despite the great advancement of modern science and technological skill, our total food production, not to speak of other necessities, has not kept pace with the growth of population. On the contrary, our natural resources are not only not increasing with the growth of population, but what is worse, they are actually dwindling on a global scale, resulting in what Aldous Huxley calls "a double crisis."[181]

Indeed, Huxley's essay, "The Double Crisis," had appeared in the April 1949 issue of the *UNESCO Courier* journal. As R. S. Deese shows, Huxley's essay served as a clarion call for the postwar population control movement, but its fatalism had caused editors at

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[179] "Inter-Office Correspondence from RBF to JHW," 1947, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[180] Bashford, 285.
181 "Demographic Disarmament for India: A Plea for Family Planning, Presidential Address by Dr. S. Chandrasekhar," 1951, p. 1, Folder 862, Box 90, Series 464, RG 1.2, Program and Policy, RF, RAC.

Harper's, Life, Foreign Affairs, and the *Atlantic* to reject its publication.[182] At least in a rhetorical sense, Huxley was perhaps ahead of his time as fears of a population "bomb" would sweep popular publications and scholarly journals through the 1950s and 1960s, articulated notably by businessman Hugh Moore in 1954 and biologist Paul Ehrlich in 1968.[183] Either way, Huxley's warning of an impending ecological crisis brought on by overpopulation caught Chandrasekhar's attention. Postwar population growth rates were indeed increasing rapidly, though perhaps not at a rate that would bring the global total to 9.2 billion by the year 2000, as Chandrasekhar projected in his 1951 remarks to the Family Planning Association. Nevertheless, by invoking Huxley, author of the dystopic novel, *A Brave New World,* and the brother of Julian, Chandrasekhar linked India's challenges to the wider discussion surrounding global population regulation.[184] He also expressed fears of overpopulation and resource exhaustion that were becoming commonplace within the global scientific community and the popular press in the postwar years, particularly following the publication of the influential article, "The World Demographic Transition," by American sociologist Kingsley Davis in 1945, which contended that industrialization itself held the key to fertility decline.[185]

When coupled with perceived resource degradation and the apparent causal link between strict food shortages and famine, the postwar population boom presented India's policymakers and economic planners with a frightening glimpse of things to come. It was

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[182] R. S. Deese, "The New Ecology of Power," in J. R. McNeill and Corinna R. Unger, eds., *Enivironmental Histories of the Cold War* (New York: Cambridge University Press, 2010), 292.
[183] Bashford, 306. See also, Paul R. Ehrlich, *The Population Bomb* (New York: Ballantine Books, 1968). The concept of a population 'bomb', which blurred the lines between fears over atomic weaponry and overpopulation, appears to have originated with Dixie Cup Company founder Hugh Moore's publication of a pamphlet by the same name in 1954. For a brief explanation (and defense) of the concept, see Paul R. Ehrlich and Anne H. Ehrlich, "The Population Bomb Revisited," *The Electronic Journal of Sustainable Development* 1, no. 3 (2009): 63-71.
[184] "Demographic Disarmament for India: A Plea for Family Planning, Presidential Address by Dr. S. Chandrasekhar," 1951, p. 2, Folder 862, Box 90, Series 464, RG 1.2, Program and Policy, RF, RAC.
[185] Bashford, 305-306.

their contention that time was running out and a classic Malthusian catastrophe loomed on independent India's horizon. By Chandrasekhar's own estimates, only immediate, radical advances in developing India's agricultural sector, encouraging urbanization, and promoting family planning could prevent it, guaranteeing a stable future for the new nation. Following Partition and into the early 1950s, American philanthropic organizations sought to become the heroes of this effort to meet food supply and population pressures with social and scientific interventions. Motivated by the promises of financial and diplomatic support offered by the Truman Administration's Cold War-inspired Point Four Program, Rockefeller and the heftily-funded Ford Foundation moved almost simultaneously through 1949 and 1950 to investigate the prospect of launching projects in nutrition, agriculture, and community development in independent South Asia.[186] While the Second World War had postponed the Rockefeller Foundation's arrival as a force in South Asian agriculture, the conflict had also forced the foundation to transfer its institutional investments in China and Europe to Mexico, enabling a programmatic shift toward research into high-yield grain varieties.[187] Through the early 1950s, agents of the Rockefeller Foundation conducted extensive inquiries into what role, if any, their organization should play in independent India, Pakistan, and Ceylon. These discussions reveal the foundation's intentions in South Asia, exposing the ways in which thinking on the relationship between food shortage and overpopulation fundamentally steered the philanthropic planning process.

In early July 1949, the Rockefeller Foundation's top staff in New York received a memorandum entitled, "Relation of the Point IV Program to Population Problems,"

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[186] Eugene S. Staples, *Forty Years: A Learning Curve – the Ford Foundation Programs in India, 1952-1992* (New Delhi: The Ford Foundation, 1992), 7.
[187] Waterhouse, 136.

outlining federal guidelines for financing birth control programs in target nations.[188] The unsigned memo suggested that it would be inappropriate for the United States government either to promote or oppose projects of population control launched by the governments of developing and decolonizing countries. That said, government officials should not discourage birth control programs if they were independently making progress abroad. After all, the "savings of lives" promoted by public health projects and humanitarian efforts would likely raise population growth rates and jeopardize economic development, undermining the objectives of the Point Four Program.[189] The United States would not, however, directly fund birth control measures, and "requests for assistance in such projects would normally be referred to private or international agencies."[190] As the memo concluded: "The only definitive check on population growth consonant with humanitarian ideals is the voluntary reduction of births whether through the postponement of marriage, continence, or other forms of family limitation."[191] In this way, the door had been opened for private philanthropic organizations to take the lead in the global population control movement, though such efforts would not receive the explicit support of the United States government under the Point Four Program. It remained now for Rockefeller officials to decide how their organization — and the closely-related Population Council that would be launched by John D. Rockefeller III in 1952 — would proceed in South Asia.

For the time being, the task of calculating precisely how to invest Rockefeller's funds in South Asia fell to chief scientific staff at the foundation. Warren Weaver, the influential director of the Rockefeller Foundation's Division of Natural Science from 1932

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[188] "Confidential: Relation of the Point IV Program to Population Problems," 1949, p. 1, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[189] Ibid.
[190] Ibid.
[191] Ibid., 1-2.

to 1955, began his career as a mathematician at the University of Wisconsin.[192] During the Second World War, he served with the U.S. National Defense Research Committee and spent time on assignment in London, supporting Britain's development of radar and anti-aircraft systems. For his work, the British Government awarded him the King's Medal for Service in the Cause of Freedom in 1948.[193] While visiting Carlsbad, New Mexico in July 1949, Weaver composed a series of memoranda investigating the foundation's postwar priorities for scientific research. One memo, "Translation," would become an important theoretical text in early computing research into linguistics and the prospect of machine translation.[194]

Weaver also wrote another memo on that trip, entitled "Food and Population." It circulated widely among Rockefeller Foundation staff and scientists as plans for work in agricultural development and nutritional research in South Asia took shape. As Alison Bashford notes, Weaver's influential analysis boiled the global food problem down to an issue of efficient solar energy exploitation.[195] Weaver calculated that the average American required 3,000 calories per day from food and about 125,000 calories per day from carbon-derived fuels. The global average for each figure stood somewhat lower, however, at 2,400 for food and 6,000 for fuel.[196] In accounting for these average energy needs, a total figure for global energy demand could be derived. Weaver argued that considering the food problem primarily as an energy problem, Rockefeller's Natural Science Division could more effectively focus on improving the ways human bodies absorb solar energy. More

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[192] "Warren Weaver Biographical Data," Folder 330, Box 8, FA 485, Biographical Files, RF, RAC.
[193] Ibid.
[194] Ibid.
[195] Bashford, 289.
[196] Warren Weaver, "Population and Food," July 17, 1949, p. 5, Folder 474, Box 42, Series 474, RG 1.2, Program and Policy, RF, RAC.

importantly, Weaver rejected Malthusian projections of a coming food catastrophe and placed faith in the potential for science to escape the "traditional patterns of the past."[197]

Beyond undertaking such seemingly futuristic and speculative analyses, Weaver was also tasked with evaluating the foundation's basic strategy in India. On January 30, 1951, he circulated among Rockefeller staff his strategy for the foundation's proposed collaboration in agrarian development with the Allahabad Agricultural Institute under its new principal, Arthur T. Mosher. Joseph H. Willits, director of the foundation's Division of Social Sciences, noted his own personal connection to Allahabad; at an intercollegiate Y.M.C.A. conference in 1912, he had nearly been persuaded by the charismatic Sam Higginbottom to become a missionary in India. As Willits reflected, "The Indians have had to suffer many things, but from that, at least, they have been spared."[198] Moving on from the mission deferred, the memo detailed Weaver's thinking on the utility of an expanded Rockefeller intervention in India.

Weaver began by presenting a simple fraction originally conceived by American geographer, J. Russell Smith, which placed "Developed Resources" as the numerator above the denominator "Population." Dividing the former by the latter yielded "Average Level of Living."[199] With this ratio, Weaver argued that India, with its vast population and underdeveloped food resources, presented one of the best platforms from which to improve the standard of living for the entire world. Echoing his optimism in the widely-circulated "Food and Population," Weaver explained the practical implications of the ratio he had introduced:

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[197] Ibid., 1.
[198] "Warren Weaver's Memo Re: Allahabad," January 30, 1951, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[199] Ibid.

> I assume RF has decided not to try to encourage studies and methods which would tend to shrink the denominator of the above fraction, but, rather, to increase the denominator (in my judgement quite properly) by continuing work in public health. The shrinkage of the denominator would be left for nature "to take her course" by the century-long processes of modernization, urbanization, and education.[200]

In the face of those assumptions, Weaver concluded that, given the foundation's existing investments in public health, Rockefeller's best course of action in India would be to work toward increasing the food supply "faster than Indians breed."[201] He offered a note of caution that such efforts would inevitably "provide the world with a lot of additional Hindus, Moslems, and Untouchables, of which we already have a fair stock of samples."[202] Strikingly, this racialized commentary echoed Mosher's own assessment of India's agricultural situation. As he concluded in a 1950 solicitation pamphlet that emphasized the Allahabad Agricultural Institute's Christian mission: "The greatest obstacles to progress for the masses of India are certain basic beliefs which have been inherited from Hinduism. Hindu culture is so interwoven that no problem — economic, social, political, or religious, — can be solved successfully in isolation."[203] In this way race — and religion — featured prominently within the categorizations of Indian agriculture as 'backward' on the part of Rockefeller Foundation agents. For these experts, the need to balance the equation between population growth and food production rested upon the assumption that the Indian 'masses' were intrinsically inclined to reproduce uncontrollably. On the same token, Indians were also completely incapable of revising their cultivation practices without the help of white Christians and their modern methods.

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[200] Ibid.
[201] Ibid.
[202] Ibid.
[203] Arthur T. Mosher, "Allahabad Agricultural Institute: Present Resources," 1950, p. 2, Folder 221, Box 28, Series 464, RG 1.2, India, RF, RAC.

For Mosher, and Higginbottom before him, Christianity, science, and whiteness went together seamlessly, informing one coherent gospel of rural development. Within such an analysis, British colonialism received little to no attention as a purveyor of inefficient, exploitative practices. Certainly not at odds with such a worldview himself, Weaver proposed a fact-finding mission to India to consider investments in agricultural research and to evaluate the rural extension agenda of the Allahabad Agricultural Institute.[204]

In December 1951, owing in part to the consistent attention it had received from Rockefeller officials, the Allahabad Agricultural Institute received one of the first grants enabled by the Ford Foundation's inaugural appropriation of $3,725,000 for community development and rural extension work in India.[205] With the eager support of Prime Minister Jawaharlal Nehru, Surendra Kumar Dey's emerging Ministry of Community Development also received extensive support in this first funding initiative.[206] Over the coming decade, Ford's support would situate the Allahabad institute in a central role within the broader network of community development and rural extension work. With Mosher now in the lead at the institute, Higginbottom's missionary project stood poised to become a center for village worker training and research into agricultural practices over the next decade. As David Nally and Stephen Taylor show, Mosher, influenced in no small part by his mentor Theodore W. Schultz, would advance an agenda of rural modernization in his later role as president of the Rockefeller-funded Agricultural Development Council (ADC).[207] In the shorter term, however, the Allahabad Agricultural Institute served as a conduit through

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[204] "Warren Weaver's Memo Re: Allahabad," January 30, 1951, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[205] Staples, 7.
[206] Ibid., 7.
[207] David Nally and Stephen Taylor, "The Politics of Self-Help: The Rockefeller Foundation, Philanthropy and the 'Long' Green Revolution," *Political Geography* 49 (2015): 7.

which the Ford and Rockefeller foundations could disseminate the materials and methods that would come become hallmarks of the later Green Revolution.

That same month, the Rockefeller Foundation's board of trustees sent a group of scientists and top program officers to India to investigate the potential for programmatic investments in the subcontinent. For some, visiting independent India underscored the overpopulation crisis about which they had previously only theorized. From Bangalore, for instance, Alan Gregg relayed a dispatch, entitled "Precarious Welfare," back to Rockefeller's New York office on December 10, 1951. Now vice president of the foundation, Gregg pondered his organization's potential role in India.[208] Like Weaver, Gregg asked his colleagues to indulge him in a thought experiment to clarify his concerns about Rockefeller's coming intervention in South Asia. "Imagine an uninhabited island with a population of about 1,000 head of deer," he began. On the island, the deer faced three factors which restricted their numbers: an inadequacy of parasite-free water, a limited amount of forage, and hungry pumas. He continued: "Now what will happen if you construct one clean and steadily flowing water trough or well, hold a successful puma hunt every year, and introduce successfully a few new forage grasses?" The deer population would increase, Gregg predictably concluded.[209]

Corresponding with the forces of pestilence, famine, and war pulled directly from the pages of Malthus, the factors limiting the deer population on Gregg's imagined island represented precisely the same elements Rockefeller looked to constrain in India. From the heart of South India, the Rockefeller Foundation's vice president dispatched an urgent warning to his more confident scientific colleagues:

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208 Alan Gregg, Memo entitled "Precarious Welfare," December 10, 1951, Folder 1, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
209 Ibid.

> It seems to me that the main problem for us in India is to teach the Indians how to produce locally and by themselves the knowledge and skills now and till now furnished to them by the West. Medical science, stability of government, and agricultural technology have made possible the growth in population, and on these their enormous number now utterly depend.[210]

In contrast with Weaver's cautiously optimistic estimates of the capacity for science to manage growing populations, the physician Gregg lamented that Rockefeller's programs might trigger the very sort of Malthusian crisis the foundation hoped to avert. With Gregg's vivid and dehumanizing warning duly noted, the Rockefeller Foundation continued its broad investigation of conditions in India, searching for a programmatic opening and focusing on the convergences between public health and agricultural science.

Though striking, Gregg's concerns by no means represented an outlying opinion within Rockefeller officials' discussions of programming possibilities in independent South Asia. Mirroring Gregg's foreboding evaluation from the previous year, Dr. Richmond K. Anderson, assistant director of the Rockefeller Foundation's Biological and Medical Research Division and future associate director of the Population Council, wrote on March 5, 1952:

> It seems entirely fallacious to say that because public health has done a good job in preserving human life, we should therefore now stop our efforts and promote economic development and agriculture. […] Giving security and ample food to an animal is the best possible stimulus to multiplication and without motivating forces toward smaller families, there is no reason to suppose that man would not act the same.[211]

Again, the assessment of conditions on the ground in India hinged on the idea that exclusive support for welfare initiatives in public health and agricultural development might simply compound the perceived population crisis facing Asia. In contrast with the optimism expressed by Weaver, Aykroyd at the FAO, and even the earlier Famine Inquiry

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[210] Ibid.

211 Excerpt from Dr. Richmond K. Anderson's Diary, March 5, 1952, Folder 1, Box 1, Series 460, Record Group 1.2, Program and Policy, RF, RAC.

Commission, Anderson and Gregg articulated a common concern among Rockefeller and Ford officials that development investments in independent India would merely fuel the perceived global population crisis of the postwar era.

CONCLUSION

At 5:20 p.m. on November 29, 1956, Renuka Ray, the Minister for Rehabilitation of the state of West Bengal, began to speak about the welfare of displaced persons in the long aftermath of Partition. Her words were carried across the country from the Calcutta station of All India Radio, just as W. R. Aykroyd's speech on nutritional health had been six years earlier.[212] Once again, radio served the important function of disseminating public health information and reports of the progress of development projects being undertaken by the government in face of a population crisis. Nearly a decade after Partition, Ray reported that over four million refugees had entered West Bengal and were continuing to arrive from East Pakistan. As opposed to the case of East Punjab, where displaced persons had arrived in a relatively short time in what was approximately an equal population exchange, Ray argued that Partition had left West Bengal with a population density that was "practically the highest in India."[213] On top of that, her ministry struggled to distribute aid and assign farmland to incoming cultivators, with many forced to till tracts that were "either water-logged or submarginal in character" and scarcely capable of meeting her state's food production needs. This local population crisis, might even demand costly drainage and irrigation projects to supply "the overcrowded economy of this State" with much-needed farmland. Still, she told her listeners, there was hope:

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[212] Renuka Ray, "The Rehabilitation of Displaced Persons in the Second Five-Year Plan," November 29, 1956, p.1, Subject File no. 3, Speeches by Renuka Ray, Renuka Ray Papers, NMML.
[213] Ibid., 2.

> Yet, while the increasing influx is affecting us adversely, it cannot be denied that the large numbers of displaced persons who have come in earlier years are an asset in many ways. Due to their endeavor, large tracts of land that were lying fallow have been cultivated and they have helped in the increase of food production in the state.[214]

In this way, Ray's broadcast revealed the social dimension of government efforts to stem the tide of the perceived 'double crisis' of overpopulation and food supply shortage. As will be seen in the next chapter, officials of the independent Indian state coordinated with American philanthropic organizations through the 1950s, launching programs in refugee rehabilitation, rural extension, and community development. These projects had clear roots in the late colonial assumptions of missionaries, humanitarians, and scientists who cultivated a keen interest in the relationship between population growth and food production.

In no small measure, the vision of the population crisis ahead had been shaped by the experience of recent crises. India's return to famine and war in the 1940s played a direct role in the emerging vision of food shortage and overpopulation in the 1950s and beyond. The Partition of India in 1947 generated mass migrations and humanitarian emergencies that would be used to justify social and scientific interventions on the part of the Indian state and American philanthropic organizations alike. Further, just as late colonial ideas about the improvement of agricultural education, the development of high-yielding grain varieties, and the improvement of nutritional outcomes grew up in conversation with one another, they would continue to evolve together after independence.

In turn, optimistic notions of scientific innovation and knowledge-sharing ran up against Malthusian visions of impending demographic catastrophe. At the meeting places between a dismal vision of food shortage and overpopulation and a self-assured vision of science in the service of human welfare, philanthropic organizations and new international

[214] Ibid., 2-4.

agencies focused their planning efforts in the early postwar period as colonialism unraveled. Following Partition, these institutions would attempt to address what was popularly viewed as global population crisis and set down the assumptions of international development as a discrete field of theory and practice. The Rockefeller Foundation's first fact-finding mission to investigate a potential intervention in Indian agriculture would present its assessment in New York in early 1952. As will be shown in Chapter Four, its conclusions would inform the assumptions of the Rockefeller Foundation and the newly-created Population Council as they launched their operations in India in 1956 and 1952, respectively.[215] In the meantime, however, similar assumptions about the relationship between South Asia's dwindling food supply and its burgeoning population would set the stage for interventions in refugee rehabilitation, rural extension, and community development, as will be examined in the next chapter.

[215] Waterhouse, 140.

Chapter Two: A Road to New India[216]

Though an ardent secularist averse to religious sentimentality, Surendra Kumar Dey discerned a deeper meaning in the place selected for the refugee camp on the highway leading to Delhi. As he surveyed the camp at Kurukshetra, East Punjab in late September 1947, he observed a plain littered with the tents, carts, and scattered belongings of nearly three hundred thousand Sikh and Hindu refugees from the newly formed West Pakistan. These former residents of western Punjab, Sind, and the North-West Frontier Province had been displaced by the violent division of British India at the end of empire. Though intended as a "temporary night halt," they now found themselves stranded on the legendary battlefield of the *Mahabharata* epic, upon which Krishna conversed with Arjuna in his chariot.[217] As Dey observed:

> Kurukshetra was the battlefield millennia back to decide whether the brothers were right to fight for a speck of land and whether battles did ever decide anything at all. She was to receive the first shock of this new flood-tide. […] The way of return to the home which belonged to them was for ever closed. A curse could be transformed into a blessing. We could resurrect life out of the vault of death.[218]

Eager to serve the nation and captivated by the symbolism of Kurukshetra, the forty-two-year-old Bengali engineer who had trained at Purdue and the University of Michigan left a management position with the General Electric Corporation and volunteered as technical advisor to India's Ministry of Rehabilitation in New Delhi. He returned to Kurukshetra in December 1947 with Prime Minister Jawaharlal Nehru's blessing to establish a vocational training center. Dey named the initiative *Mazdoor Manzil* or "Workers' Destination".[219]

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[216] Portions of this chapter were published in the form an article in the journal *Contemporary South Asia* in March 2017. See Jack Loveridge, "Between Hunger and Growth: Pursuing Rural Development in Partition's Aftermath, 1947-1957," *Contemporary South Asia* 25, no. 1 (2017): 56-69.
[217] S. K. Dey, *Nilokheri* (Bombay: Asia Publishing House, 1961), 7.
[218] Ibid.
[219] Ibid., 20.

Dey's initial goals for the Mazdoor Manzil project appeared modest enough. He sought, first and foremost, to provide the refugees at Kurukshetra with vocational training in artisanal work, including textile weaving and brick making. He emphasized the intrinsic value of work and discouraged idleness among Kurukshetra's dazed refugees. Quickly though, Dey, who had himself grown up in poverty in a Bengali village now subsumed into East Pakistan, expanded his objectives. He set his sights on forging a model township out of Kurukshetra's 'inmates,' as he referred to them. In late 1948, with approval from the Ministry of Rehabilitation and the enthusiastic backing of Nehru, Dey resettled about three thousand refugees on the swampland adjacent to the evacuated Muslim village of Nilokheri, eighteen kilometers south of Kurukshetra.

Through the early 1950s, Nilokheri shed its legacy as a rehabilitation project and emerged as a prime model for community development among India's economic planners. The project garnered attention from national and international press, quickly drawing the interest of American philanthropic organizations and international development experts eager to test their theories of modernization and generate a replicable model of rural development. With support from the Ford Foundation, Nilokheri made a swift transition from a 'rehabilitation township' to become by 1952 the national hub for rural extension and community development training, drawing international expertise to India and preparing thousands of village workers to fan out across the subcontinent to lead rural reconstruction projects.

This chapter examines how independent India's community development initiatives of the 1950s emerged in critical ways from the immediate imperatives of post-Partition refugee rehabilitation. Under Dey's leadership during the 1950s and through his later influence as India's Minister of Community Development, the initiative that began as the Nilokheri rehabilitation township would mark the first substantial state-funded

community development and rural extension training project launched by the new nation. Building upon the example of the Nilokheri project, and supported by the Ford Foundation and the United States Technical Cooperation Administration (TCA), the Government of India's community development and rural extension initiatives of the 1950s expanded the reach and methodologies of international development organizations across rural India. At the same time, the community development methods tested at Nilokheri and refined in the rural extension training programs of the Ford Foundation still struggled to engage women effectively, drawing official criticism for neglecting half of India's rural population. Nevertheless, these models of rural development and knowledge sharing would channel state and philanthropic efforts to increase Indian food production, influencing the course of the Green Revolution.

HUNGRY FOR WORK

Tensions between the central government and East Punjab's administration over the trajectory of post-Partition rehabilitation set the stage for independent India's first state-led foray into community development programming. On October 3, 1948, Indian Prime Minister Jawaharlal Nehru dashed off an angry letter to Gopichand Bhargava, a loyal member of the Indian National Congress and the Chief Minister of East Punjab: 'The problem which has been troubling us very greatly is that of the people at Kurukshetra Camp, more specially the Frontier refugees. This is a very urgent matter requiring immediate consideration.'[220] Nehru expressed dismay at Rehabilitation Minister Mohanlal Saksena's recent report on the languishing rehabilitation efforts in East Punjab and was particularly disturbed by the lack of progress at the overcrowded Kurukshetra site. 'Everything is hung up because the East Punjab Government has not yet allotted sites for

[220] Jawaharlal Nehru to Gopichand Bhargava, October 3,1948, Folder 1, Correspondence, Gopichand Bhargava Papers, NMML.

their rehabilitation,' continued Nehru in the same letter, placing the blame squarely on Bhargava and his administration.

Almost fourteen months after Partition, and with eight million refugees scattered across the Indian portions of Punjab and Bengal, Nehru's frustrations with East Punjab's rehabilitation initiative seemed justified.[221] In both East Punjab and West Bengal, rehabilitation failed spectacularly in its initial objective to settle displaced persons on new land and in new homes quickly. Conflicts between the central government and the administration of East Punjab over the distribution of agricultural lands distracted the refugee resettlement process, leaving hundreds of thousands of Hindus and Sikhs in camps like Kurukshetra, surviving on meagre government aid and rationed food.[222] Over the eighteen months following Partition, Nehru's frustrated correspondence with Chief Minister Bhargava underscored the fundamental tension between the stated objectives of India's central government and the actual outcomes pursued by state officials. Rather than proportionally redistributing the land of Muslim evacuees to refugees who had held land in West Pakistan, Nehru alleged that East Punjab officials had allowed massive tracts of land to become consolidated in the hands of a few non-agriculturalists on the basis of "communal and personal considerations."[223] Nehru lamented that state officials had distributed the abandoned property of Muslim evacuees inequitably, dismayed by the prospect of creating a new landholding class just as efforts had begun in the United Provinces to dismantle the hereditary *zamindari* system. Varied state-level legislation aimed at land reform proceeded in Assam, Bihar, Orissa, West Bengal, Uttar Pradesh, and Rajasthan between 1950 and 1954, with proprietary holdings transferred from the vast

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[221] Khan, 134.
[222] Ibid., 163.
[223] Nehru to Bhargava, February 4, 1949, File 1, Correspondence, Gopichand Bhargava Papers, NMML.

estates of absentee landlords to state governments themselves.[224] At the same time, Francine Frankel argues that zamindari abolition "fell far short of an agrarian transformation," showing that landlordism did not necessarily end with the legislative programs championed by politicians like Chaudhary Charan Singh and others. Further, she argues that zamindars were typically well-compensated for the loss of their hereditary rights and that the revised proprietary arrangements between those who worked the land and state governments did little to immediately improve the lot of the rural poor who simply assumed leases from new landholders.[225]

Meanwhile, in East Punjab, the major agricultural issue that emerged in Partition's wake was less a matter of hereditary land tenure and more a concern over the land rights of shifting populations. In his correspondence with Bhargava, the Prime Minister also criticized the East Punjab government's apparent favoritism toward Sikh refugees, as well as the systematic persecution of *dalits* and neglect of refugees from the North West Frontier Province.[226] While officials in East Punjab had resettled most Punjabi Sikh refugees within a year of Partition, Nehru observed that most Hindus and refugees from the North West Frontier remained in the camps.[227] Further, East Punjab state officials expressed fears that the departure of the highly productive Muslim tenant farmers and artisans who had populated the East Punjabi countryside would spell the state's doom, precipitating not just an economic slump, but also a food crisis as the East Punjab faced an annual food grain production deficit of some 35,000 tons.[228] Like a large number of the inhabitants of the Kurukshetra camp, many of the incoming refugees had been shopkeepers, clerks, and

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[224] Frankel, 190.
[225] Ibid., 191.
[226] Nehru to Bhargava, February 4, 1949, File 1, Correspondence, Gopichand Bhargava Papers, NMML.
[227] Nehru to Bhargava, November 19, 1949, File 1, Correspondence, Gopichand Bhargava Papers, NMML.
[228] Kudaisya, 75.

merchants. With such occupational backgrounds, these Hindus and Sikhs had little experience with the crafts and trades characteristic of village life in Karnal District, much less actual cultivation.

Meanwhile, in West Bengal, Renuka Ray's parallel work in support of the 4.26 million displaced from East Pakistan between 1946 and 1962 had also begun.[229] After completing her tenure in the Constituent Assembly of India in 1947, the All India Woman's Conference activist moved quickly to advocate for the women of the independent nation. In an article published in the magazine, *The People,* in July 1951, she connected women's social status to the enduring implications of British colonialism. As she wrote: "In India, the conditions that operated in bringing restrictions upon women are closely woven with the general degradation that led to the subjugation of the race."[230] Ray went on to write that this intimate connection between racial and gender-based oppression implied that women now enjoyed equal status with men as citizens of free India.[231] This equality, she argued, demanded giving "full recognition to the value of the housewife" as the "home is the nucleus of the nation."[232] In turn, Indian society must strive to properly equip mothers with the education and practical knowledge necessary in "rearing a healthy race."[233] To meet that duty, Ray argued, women must be healthy themselves — in mind and body. She opposed child marriage and emphasized that women must play active roles in the social and political lives of their communities, particularly in India's villages. As she wrote:

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[229] Joya Chatterji, "Right or Charity: The Debate Over Relief and Rehabilitation in West Bengal, 1947-50," Suvir Kaul, ed. *The Partitions of Memory: The Afterlife of the Division of India* (Bloomington: Indiana University Press, 2001), 102-103.
[230] Renuka Ray, "Women as Citizens of Free India," July 6, 1951, p. 1, Folder 14, Speeches and Writings by Renuka Ray, Renuka Ray Papers, NMML.
[231] Ibid., 2.
[232] Ibid., 4.
[233] Ibid.

> It is one of the greatest tragedies of India that in a primarily agricultural country, the basic requirements of food itself cannot be met through our own efforts. In an attempt to reorient our agricultural system so that that we are able to provide sufficient food and also introduce the co-operative endeavour through which alone a more just distribution can take place, women can play a very significant part.[234]

In this way, Ray's vision of gender equality in independent India intersected neatly with rising plans to reshape rural life across the nation. With women expected to play a critical role in supporting increased agricultural production, Ray's argument hinged upon concern for a "healthy race." Further, in supporting the Sarvodaya Plan of the Congress Party's Jayaprakash Narayan, Ray signaled a desire for co-operative ventures, a freer hand for cottage industries, and decentralized, community-level planning in agricultural production.[235] In Ray's work as the Minister of Rehabilitation for West Bengal from 1952 to 1957, these concerns featured prominently in her own efforts to facilitate refugee rehabilitation and rural community reorganization. The process would, however, prove difficult in West Bengal, with the flow of post-Partition refugees persisting through the 1950s.[236]

The daunting prospects for rehabilitation in both West Bengal and East Punjab fed into S. K. Dey's theory that the refugees at Kurukshetra must be resettled, not on the limited farming plots formerly held by Muslim evacuees, but on previously uncultivated land. There, he believed that his vocational training efforts would provide the basis for a self-sufficient village of five thousand people that would serve as the hub for a wider block of farms. On a swampy swath of wasteland, he could also test his theory that productive labor stood as the central cohesive element in a healthy community. Dey found such a place near

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[234] Ibid., 6.
[235] Ibid.
[236] Renuka Ray, *My Reminiscences: Social Development During the Gandhian Era and After* (New Delhi: Allied Publishers Private Limited, 1982), 56.

the 85th milepost on the Grand Trunk Road in Karnal District. Writing in 1961, Dey reflected on what drove him toward the challenge at Nilokheri: "I was hungry. One who is hungry for work could be much deadlier than one who is hungry for food."[237] Very much hungry for food, the refugees at Kurukshetra initially resisted Dey's proposal to relocate three thousand of them to the swampland to build up a town from scratch. However, as control over the Kurukshetra camp shifted back and forth between the hapless state government and Nehru's frustrated central Ministry of Rehabilitation through 1949, permanent resettlement appeared unlikely. A small group of refugees decided to try their luck with Dey and his vocational and agricultural training experiment.[238]

TESTING THE HYPOTHESIS

Under Dey's supervision, the rehabilitation township at Nilokheri rose as a prime example of the possibilities of community development in India during the 1950s, attracting attention and funding from the American Ford Foundation. Nicole Sackley and Daniel Immerwahr have shown that community development emerged as a contentious global movement of communitarian organizing, rural extension, and democratic empowerment from the 1930s through 1960s.[239] It represented a widely-replicated model of local-level interventions informed by social scientific inquiry, at times influenced by the Cold War priorities of the United States, and championed by a handful of international agencies and American philanthropic organizations, including the Ford and Rockefeller foundations. While admirably demonstrating the global dimensions of the community development movement, this work has done less to explore its relationship to local post-Partition rehabilitation efforts, situating such projects in the context of decolonization. As

[237] Dey, 12
[238] Ibid., 30.
[239] See Sackley, "Village Models: Etawah, India, and the Making of Development in the Early Cold War," 749-778. and Immerwahr, 1-14.

it emerged under Dey's leadership through the late 1940s and into the early 1950s, the former rehabilitation township would become an international model of the community development ethos at work.

Through the winter of 1948 and into the spring of 1949, Nilokheri's first five hundred residents remained housed in tents. Aside from a handful of workshops set up in temporary sheds, the Nilokheri site seemed little more than a swampy suburb of the still bustling refugee camp at Kurukshetra. The transplanted vocational training center, holding fast to the Mazdoor Manzil slogan, sat at the heart of the new site. Training unskilled refugees how to make productive lives for themselves remained at the core of the project and closely resembled efforts being taken, on paper at least, to situate refugees in homes in jobs in urban areas across East Punjab.[240] Despite Nilokheri's ramshackle state, Nehru visited the village in April 1949 to check on Dey's progress. Significantly, he was accompanied by Countess Edwina Mountbatten, British India's last vicereine.[241]

Instead of welcoming Nehru and Mountbatten with countless garlands as had become customary in villages across India, the residents of the "rehabilitation township" surprisingly greeted the distinguished visitors with little more than muted respect. Dey assured the Prime Minister that this restraint reflected the refugees' eagerness to show themselves hard at work in "building a home for themselves and the road to the India of tomorrow."[242] The former engineer then led Nehru and Mountbatten on an inspection of the village of tents, sketching out plans for setting the concrete foundations of Nilokheri's houses, schools, and workshops during the spring of 1949.

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[240] "Report on the Progress of Urban Rehabilitation for the month of February 1949," 1949, p. 1, Folder 25777, Series 482, East Punjab Central Secretariat Records, PSA.
[241] Dey, 71.
[242] Ibid., 72.

Providing able-bodied refugees with training for artisanal work represented the central goal of Dey's efforts in Nilokheri. As he wrote: "If work is there, home follows; so do clothing, schooling for children, medical relief and other amenities of life. If work is not there, everything looks dark, doles and kindness notwithstanding."[243] This work-focused philosophy sprung from a desire on the part of officials to move refugees away from the 'doles and kindness' Dey mentioned. Rather than representing a utopian effort to reconfigure rural India from the start, the project at Nilokheri began as an ad hoc, necessity-driven attempt to move refugees out of the overcrowded camp at Kurukshetra. At the same time, a clear ethos of hard work and self-improvement quickly overtook the basic humanitarian concerns at Nilokheri. The township born of necessity was quickly becoming an experiment in village organization and rural development.

Nehru, for one, plainly saw a conditional relationship between relief assistance and work. As he wrote to incoming Finance Minister John Matthai on August 18, 1949, 'They [the refugees] should be made to accept, if they are willing, a semi-military regime of discipline and work. If they are not prepared to accept this, then they can shift for themselves and our responsibility ceases.'[244] In this way, displaced populations could earn the aid that they received from the central government in food, shelter, and small agricultural loans.[245]. By Nehru's reasoning, the refugees could then pull themselves up and out of the camps still scattered across East Punjab. From his perspective, the responsibility for the situation had shifted from recalcitrant state-level officials and onto the refugees themselves.

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[243] Ibid., 7.

[244] Jawaharlal Nehru to John Mathai, Finance Minister, August 18, 1949, in S. K. Sharma, ed. *Haryana Past and Present*, vol. I (New Delhi: Mital Publications, 2005), 240.

[245] For a discussion of the financial aspects of rehabilitation, see Ian Talbot, "Punjabi Refugees' Rehabilitation and the Indian State: Discourse, Denials and Dissonances " *Modern Asian Studies* 45, no. Special Issue 01 (2011): 109-130.

Through S. K. Dey's emerging doctrine of self-help, the rehabilitation township of Nilokheri provided the sort of 'regime of discipline and work' that Nehru envisioned. By early 1950, the cottage industries established at Nilokheri had grown large enough to employ about 625 refugee families.[246] With financial support from the Ministry of Rehabilitation, Dey and his colleagues helped to set up industries and trades in the township, ranging from woodworking and brickmaking to dairy farming and sheep breeding. Seemingly little was planned for engaging and training the township's women, but Dey noted the establishment of a large secondary school to educate their children.[247] A printing press ran in the town as well, rolling out the first issues of a journal devoted to rural life and farming practices in 1953. Fittingly, the journal bore the name *Kurukshetra* and carried news and information from India's Ministries of Health, Agriculture, Education, and Rehabilitation. As community development took off in India, *Kurukshetra* also featured first-hand accounts of village work from across the subcontinent, serving as a sort of clearinghouse for best practices in rural extension and development. *Kurukshetra's* editors also worked in good humor to assure readers of Nilokheri's market motives, at times even dispelling rumors that Nilokheri was a Communist stronghold thriving in the heart of Karnal District.[248] Dey's politics, however, were more closely aligned with the pragmatic democratic socialism of Jawaharlal Nehru, whom he greatly admired. As Dey wrote of community development:

> It is the common goal of all who believe in the doctrine of the Socialist society, whatever the pattern or form. The joint family was a model of the living concept of socialism in India. Community Development is but the expansion of the Indian

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[246] Dey, 37.
[247] Ibid.
[248] Palayam M. Balasundaram, "My 'Field Trip' to Project Areas," *Kurukshetra* 2, no. 4 (1953): 9-11.

> joint family till it grows organically to encompass the Village, Block, District, State and the Nation.[249]

In this way, Dey's political vision remained both sufficiently vague and all-encompassing to carry broad appeal. In his rhetoric, he closely associated community development projects with families, projecting the image that such programming was organic and merely a natural liaison between the individual household and the new Indian state.

Nilokheri was not the first model community to spring up in rural India. As Nicole Sackley has shown, Nilokheri's contemporaries included Etawah, a pilot rural development project in the United Provinces (later Uttar Pradesh) designed and managed by the American urban planner and architect Albert Mayer.[250] Mayer's work in Etawah began in 1946, predating Nilokheri, and independent India, for that matter. Dey cited Mayer as an influence on his early thinking on village development in the Mazdoor Manzil project, but the two did not collaborate extensively. The Etawah rural organizational model gained the support of the Ford Foundation and would be replicated in later rural reconstruction efforts sponsored by Uttar Pradesh Chief Minister G. B. Pant. Etawah's roots, however, did not lie in refugee rehabilitation, nor did the project there evolve into a dedicated training center for village-level workers. While not the first model village in north India, Nilokheri proved unique in that it represented a complete, self-sufficient town built by Partition's refugees. Nilokheri marked independent India's first state-led experiment in community development. As one of the new nation's principal centers for rural extension training, it also appeared uniquely placed to teach effective rural development practices to the nation and the world.

Further, Dey's project at Nilokheri directly addressed the notion of reshaping individual citizens from within, instilling in them the knowledge and independence to work

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[249] Dey, 98.
[250] Sackley, "Village Models: Etawah, India, and the Making of Development in the Early Cold War,"749.

ceaselessly in improving the community as a whole. Generally, the refugees who came to Nilokheri from the camp at Kurukshetra were of a class that Dey described with thinly-veiled disdain as 'the middlemen,' meaning those unskilled in a manual trade or cultivation.[251] He demanded that the citizens of the township should learn a trade and, with the help of generous loans and a constant stream of orders from the central government for its workshops, the project provided work for every resident during its first few years. Full employment, expansive public education facilities, and ambitious architectural plans for a central market designed by architect B. D. Manda left Nehru lamenting the project's unsustainable expenses.[252] Still, Nilokheri captured Nehru's imagination for precisely these reasons, regularly luring him back for official visits through the 1950s. He also frequently directed foreign dignitaries from other nations to visit the township. For instance, the King and Queen of Nepal paid a visit to Nilokheri in late 1955 to inspect the central government's Extension Education Institute.[253] The same royal trip included a visit to the new planned city of Chandigarh, the state capital of East Punjab planned by the renowned architect Le Corbusier, with a little help from Albert Mayer.

Beyond being showcased to the world, the growing township drew Nehru back on 22 February 1950. Speaking to the people of Nilokheri, the Prime Minister labelled the rehabilitation town 'a model to India' and expressed hope that its growing fame would spread the model across the country and around the world. Shifting his tone, he also cautioned against "idlers" within the population: "Idlers are of two types. Poor displaced persons spend something but cannot produce. The others, called rich, spend and yet do not

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[251] Dey, 12.
[252] Ibid., 23.
[253] "Report on the Visit of the King and Queen of Nepal to Nangal, Nilokheri, and Chandigarh," November 11, 1955, Folder 5837, Series F. 100, Political Files of the Punjab Government, PSA.

produce. Both are idlers and live on the toils of others."[254] Nehru was quick to clarify that Nilokheri's own citizens had proven themselves beneficial to the nation. Inspecting the township that same day, however, Nehru noted that while he had observed many men engaged in trades, he had seen few women in training. He warned the crowd that if "the other half does not join hands" in work, the nation could not hope to pull itself up from poverty Nehru's remark foreshadowed a recurrent criticism of Indian community development programs that experts would struggle to address.[255]

By the end of 1950 Dey's work at Nilokheri had attracted the attention of Paul Hoffman, president of the Ford Foundation and former chief of the Economic Cooperation Administration, which had implemented the Marshall Plan in Europe following the Second World War. Hoffman visited New Delhi in the spring of 1951, announcing a new, broadly international focus for the Ford Foundation's philanthropic endeavors to halt the feared advance of Communism.[256] Douglas Ensminger, the Ford Foundation's new representative in India, also spent the year laying the groundwork for the inauguration of mass training in rural extension and agricultural development that the Foundation would coordinate with the Government of India during the coming year. This training marked the start of Ford's broader initiative with the United States Technical Cooperation Administration (TCA) to transmit agricultural expertise and deliver on an American promise to bring development to rural South Asia. Nilokheri, boasting a population of nearly six thousand rehabilitated refugees, would provide an ideal venue in which to train brigades of rural extension workers and administrators.

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[254] As quoted in Dey, 116.
[255] As quoted in Sharma, 149.
[256] Sackley, "Foundation in the Field – the Ford Foundation's New Delhi Office and the Construction of Development Knowledge, 1951-1971," 233.

A Model of Rural Development for the World

On 5 January 1952, Prime Minister Nehru and United States Ambassador Chester Bowles met in New Delhi to sign the Indo-American Technical Agreement. As a product of President Harry Truman's Point Four Program to share American 'know-how' and counter Soviet influence in the 'underdeveloped' world, the accord emphasized investments in agricultural development and rural reconstruction through the promise of $54 million (US) in technical assistance to India.[257] That same week, Douglas Ensminger formally opened the Ford Foundation's offices in New Delhi with the aim of building the close relationship between the two countries promised within the agreement. Ford had agreed to take the first step in that relationship by facilitating the training of six thousand new village-level workers to help organize and revitalize India's 700,000 villages.[258]

The case of Nilokheri and the broader community development efforts it inspired reveals how the 'transnational development regime,' as Subir Sinha terms it, expanded in north India in the wake of Partition.[259] Sinha traces the lineage of this global economic phenomenon — including the institutions, practices, and assumptions of modern international development — to earlier rural reconstruction projects of Indian nationalists, British colonial officials, and American planners alike. Dey's Nilokheri project and the national community development schemes it inspired built upon this heritage, but its unique origins in refugee rehabilitation and resettlement distinguish it from these predecessors. Like Jawaharlal Nehru before them, the Ford Foundation's development experts took notice of Nilokheri precisely because of its origins as a vocational training initiative for unskilled refugees.

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[257] Immerwahr, 88.
[258] Sackley, "Foundation in the Field – the Ford Foundation's New Delhi Office and the Construction of Development Knowledge, 1951-1971," 241.
[259] Sinha, 58.

In July, Ensminger, along with agricultural and community development experts from the Ford Foundation and the TCA, travelled to Nilokheri to take part in the three-week-long training of India's first cohort of community "project executive officers." From July 22 to August 16, 1952, several hundred trainees attended seminars and training workshops at the recently constructed Government Polytechnic. The rigorous training schedule represented the informal start of the national Community Development Programme officially launched by Nehru and Ensminger on October 2, 1952, the anniversary of Mahatma Gandhi's birth.[260] From the helm of the new Community Projects Administration, Dey would spearhead the movement, with the hundreds of project executive officers trained at Nilokheri overseeing extension efforts in their 'development blocks' of one hundred villages each. This hierarchy of expertise would form the core of the National Extension Service, with the goal of rapidly spreading the knowledge and practices of the community development movement across rural India.[261]

This first cohort of Indian trainees at Nilokheri would organize wider rural reform efforts, serving as a critical link between the theory of community development and the farmers and villagers who constituted over eighty per cent of India's population. At a higher level, Dey's coordination with Ensminger in shaping India's community development program served as a two-way street by which abstract thinking on village work might be tested and best practices could be determined. This intermingling of foreign interests and domestic priorities during the nascence of India's community development program complicates interpretations of it as a predominantly external movement that entered South Asia following independence.

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[260] Douglas Ensminger, *A Guide to Community Development* (Delhi: The Ministry of Community Development, Goverment of India, 1957), i.
[261] Ibid., 3.

Inherited in part from the Rockefeller-funded work of the GEB in the southern United States, the American expertise surrounding community development and rural extension arrived in Nilokheri in the form of the first project officer training in the summer of 1952.[262] With the trainees attending seminars on topics as varied as communicable disease prevention, social psychology, and cattle breeding, each topic representing a field of knowledge that both American and Indian farming experts equally deemed essential to improving agrarian life.[263] The records of the proceedings compiled by the Community Project Administration show that representatives of India's own agricultural universities, polytechnics, and government ministries made up the bulk of the rural extension trainers. Rather than representing an injection of foreign doctrines and methodologies, the Nilokheri training appears to have been more a gathering and sharing of India's domestic expertise, at least to the extent that such expertise had received the Ford Foundation seal of approval. Contingents from the Ford Foundation and the TCA remained on-hand to observe and periodically offer lectures on rural life, public health, and the workings of government in the United States. They also fielded questions regarding the new Indo-American Technical Agreement, reminding the trainees of the generosity of the Ford Foundation and the new friendship being forged between the two democracies.

On 15 August 1952, the fifth anniversary of India's independence and the penultimate day of the training session, Dey delivered an address entitled, "A Road to New India," to this first cohort of trainees. In his speech, he underscored the connection between the post-Partition refugee crisis, the potential of the community development movement, and the urgent need for the nation to expand agricultural production to compensate for the

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[262] Government of India Community Projects Administration, *Orientation and Training Course for Project Executive Officers at Nilokheri: Summary Record of Talks* (New Delhi: Goverment of India, 1952), 1-5.
[263] Ibid.

losses of Partition. He observed that India's fields could yield about one-third of the crops that could be grown in the fields of other nations. Dey attributed this shortcoming, not merely to soil exhaustion and the cultivation of low-yielding varieties of grains, but more specifically to the poor farming methods employed by India's cultivators and resistance to modernizing improvements among the nation's villagers. At the same time, Dey remarked that villagers could not themselves be entirely blamed for their lack of knowledge: "A hungry man who has no work to do has time hanging on him. In sheer self-defence, he builds an artificial world within himself from which he bolts the world without."[264] The task of the rural extension workers trained at Nilokheri, he argued, would be to bring reason and scientific knowledge into this artificial world of obstinate tradition. To support that work at the national level, the Government of India launched the National Extension Service in October 1953.[265] This strategy, of course, closely resembled the late colonial era prerogatives of British agricultural officers and rural extension experimenters like Sam Higginbottom. In conversation with the continuing work at the missionary's Allahabad Agricultural Institute under the direction of Arthur T. Mosher, a doctrine of agricultural change would emerge from the combined efforts of India's community development and rural extension initiatives of the late 1950s.

RECRUITING EXPERTS, TEACHING EXPERTISE

A woman narrates the dramatic scene of her husband looming over her, demanding that she remain by his side in an Uttar Pradesh village. Crouched on a cot below him, she looks up toward the camera over his shoulder in desperation and pleads with him: "'There's a wall between us and the village people! Do you not understand that I cannot stay here?'

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[264] Ibid., 27.

[265] Indian Planning Commission Programme Evaluation Organisation, *Evaluation Report on Second Year's Working of Community Projects* (New Delhi: Government of India, 1955), 8.

But then, my husband spoke angrily and said, 'It is my will.' … It was *his* will."[266] Produced by the Ford Foundation, and directed by Austrian-American filmmaker Ernest Kleinberg, the 1953 film *Gaon Sathis* (*Friends of the Village*) tells the story of a young, college-educated couple from Calcutta who volunteer to serve in the National Extension Program.[267]

The pair receives training from a group of rural extension officers at the Ford-funded Allahabad Agricultural Institute, modelled upon the training regimen that had become routine at Nilokheri. Their instructors represent the diversity and truly global nature of the community development movement, including two Indian men and an American woman known to the couple simply as 'Molly.' During their month at Allahabad, they train in improved farming methods, animal husbandry, and the basics of home economics. After their study is complete, the young couple cycles to the village site where they will share their newfound wisdom with the local farmers and their wives.

Shot in color and intended as a recruitment tool for community project volunteers across South Asia, *Gaon Sathis* emphasized the challenges and rewards of community development work.[268] Through collaboration with the Ford Foundation, Dey's Community Projects Administration adopted an approach of training volunteers, typically educated city-dwellers with no prior experience in agricultural work, and dispatching them to India's villages as rural extension workers. In support of that national project, *Gaon Sathis* communicated a message of determination and persistence in village work, even when

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[266] *Gaon Sathis* (film), Ford Foundation Grants to Grants E-G – Government of India (05200061), Box 4, Reel AV8697, Ford Foundation Records (FF), RAC.
[267] Martin Quigley to Ernest Kleinberg, November 11, 1952, Ford Foundation Grants to Grants E-G – Government of India (05200061), Microfilm Reel 0911, FF, RAC.
[268] The Ford Foundation also commissioned Kleinberg to film a documentary on the refugee situation in West Germany. Kleinberg completed shooting for that project en route to Delhi to film *Gaon Sathis* in 1952.

social barriers appeared impassable and when arduous labor yielded paltry results. The woman featured in the film represented the comfortably urban Indian, dragged along to the village by a more inspired husband and forced to learn harsh lessons of self-reliance and national service.

In the end, she submits to her husband's will and remains committed to the task of converting an unwelcoming village into a model of self-sufficient productivity. Strikingly, her submission contrasted with the sort of empowerment described in Renuka Ray's vision of an egalitarian India that revered women for sustaining both home and community. Almost magically, her decision to stick it out prompts the villagers to suddenly embrace the deeper-cutting plough, improved well technology, and reading lessons that the couple had been pitching to them for months. *Gaon Sathis* communicated the transformative potential of the methods and work ethic of Nilokheri, representing an effort to convert urban Indians into dedicated village-level workers, or *gram sevaks*. It also signified an evolving interplay between India's Community Development and National Extension programs and the objectives of the Ford Foundation as they shifted toward a concerted push for greater food production.[269] Further, Kleinberg's film echoed contemporaneous efforts by independent India's Films Division to define development as the ultimate civic goal of the new nation. As Peter Sutoris has shown, the Films Division's post-Partition efforts sought to enlist public participation in development schemes while asserting a vision of modernity defined and directed by government experts.[270] In much the same way, Kleinberg's *Gaon Sathis* portrays official expertise steering a dutiful citizenry toward progress, albeit with initial resistance from the female character in the film.

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[269] Cullather, 134-158.

[270] Peter Sutoris, *Visions of Development: Films Division of India and the Imagination of Progress, 1948-75* (London: Hurst & Company, 2016), 100.

As depicted in *Gaon Sathis,* the Allahabad Agricultural Institute served as the main center through which the Ford Foundation launched its rural extension initiative in India in 1952. Under the direction of Arthur T. Mosher, the institution continued under the banner of Christian missionary work, even placing the slogan, "A Christian Institute of Rural Life — Founded by Sam Higgnbottom," on its letterhead.[271] At the same time, Mosher geared the Allahabad Agricultural Institute toward projecting the image of serious research at the intersection of the agricultural and social sciences. To that end, Mosher and his successor, J. B. Chitambar, established undergraduate and graduate courses in Agricultural Economics and Home Economics to cater to rising Indian students who represented the nation's next generation of rural extension officers and administrators.[272] To accomplish these goals, Mosher and Chitambar pushed the institute into closer financial and programmatic relationships with the Ford and Rockefeller foundations through the 1950s. Beyond hosting rural extension trainings for the new recruits to India's National Extension Service, the Allahabad Agricultural Institute also became involved in discussions surrounding India's population growth and food supply situation. As early as 1950, for instance, Mosher drew up pamphlets for circulation among the farming communities of Uttar Pradesh, offering simple farming advice as well as warnings against inadequate crop production in the face of rising populations. One poster for instance, bore a warning in both Hindi and English: "Bahut se muha, khana kam (Too many mouths, not enough food)."[273] Above the text, an illustration of several farm animals and a smiling baby hovered over the image of a farmer sitting down to enjoy a meal. The text continued below:

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[271] J. B. Chitambar to A. T. Mosher, January 30, 1962, Folder 4, Box 1, Series 464, RG IV 3B1.33, Subgroup 3.3, Agricultural Development Council Records, RAC.
[272] Ibid.
[273] "Allahabad Agricultural Institute — India," 1950, p. 15, Folder 222, Box 28, Series 464, RG 1.2, Projects, RF, RAC.

> You know many people in our country are starving. Where does the food go? Cows eat some, parrots eat some, rats and wild animals eat some. Our babies do not get enough. What shall we do?[274]

Rather than offering a clear answer to the question, the poster appears to have been more an advertisement for the Allahabad Agricultural Institute, encouraging farmers to avoid wastage and also to visit the institute itself for more information on improved agricultural methods. In this way, Mosher's institution worked to build both its programming and its profile in Allahabad, engaging concerns over food shortage and population growth to advocate for the fertilizer-fed and tractor-driven agriculture demonstrated within its rural extension programs.

Through the early 1950s, Mosher also developed a regular correspondence with J. G. Harrar and Warren Weaver of the Rockefeller Foundation — a continuation of the connection his predecessor Higginbottom had cultivated with John D. Rockefeller, Jr. Mosher, who was also affiliated with Cornell University, informed the Rockefeller Foundation that he planned to expand the institution at Allahabad in February 1956.[275] Building off financial support from the Ford Foundation, Mosher wrote that he hoped to raise a further $1 million to improve the rural extension training courses held at Allahabad. He encouraged Rockefeller to help him in the quest to increase attendance at his institution and to begin with a $300,000 donation to create a reserve fund that could be called upon in the future to expand the reach of extension work across Uttar Pradesh. In his diary, Harrar recorded his skepticism of the project, noting that he could not find the logic in turning over so much money to Mosher to be held in reserve.[276] Harrar did, however, believe that Mosher's underlying plans for amplifying his institution's work in rural extension were

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[274] Ibid.
[275] "Excerpt from Diary of J. G. Harrar," February 28, 1956, p. 1, Folder 220, Box 28, Series 464, RG 1.2, Projects, RF, RAC.
[276] Ibid., 2.

sound and Rockefeller continued to support the institute's education programming through smaller grants into the early 1960s.

The model of expert-driven agricultural development being driven by simultaneous programs at Allahabad under Mosher and Nilohkeri under Dey pursued the objective of stimulating vas food production increases through social intervention and rural education. By the middle of 1953, the Nilokheri project's initial goal of refugee rehabilitation merged with state and philanthropic efforts to increase grain yields, shifting strategy to help pick up the slack of the unsuccessful Grow More Food program.[277] Beyond converting displaced persons into model villagers through the lessons of hard work, vocational training, and improved farming methods, the Ford Foundation's brand of community development now sought to establish India's self-sufficiency in food production. The methods of rural extension training elaborated at Nilokheri's education centers would prove vital in this effort, converting urban Indians into village workers and program executives. Along the same lines, the May 1953 issue of *Kurukshetra* attempted to resolve the broad social focus of India's community development push with increasing demands from Nehru and the Planning Commission for tangible results in increasing food production. For instance, V. T. Krishnamachari, deputy chairman of the Planning Commission, drew a direct connection between rural unemployment and food production deficits.[278] Considering the issue a "human problem" and citing the limited success of the Grow More Food Programme, Krishnamachari advocated for increases in rural employment coupled with the introduction of "scientific agricultural methods." While agricultural science and new

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[277] For a detailed assessment of the Grow More Food program and its relevance within postcolonial nutritional policy, see Taylor Sherman, "From 'Grow More Food' to 'Miss a Meal': Hunger, Development, and the Limits of Postcolonial Nationalism in India," *South Asia: Journal of South Asian Studies* 36, no. 4 (2013): 571-588.

[278] V. T. Krishnamachari, "Need for New Outlook," *Kurukshetra* 1, no. 10 (1953): 23.

fertilizers, seeds, and farming technologies could increase grain yields over time, Krishnamachari argued that only the promotion of "self-help and self-reliance" could organize rural Indians into a truly productive agricultural labor force.[279] The broad social objectives of community development and the knowledge network building of the rural extension program could thus be harnessed to achieve concrete economic ends.

Along with regular issues of the journal *Kurukshetra,* the government printing press at Nilokheri published a wide array of training guides and manuals intended for the education of prospective village-level workers and program executives. One such manual written by Douglas Ensminger, *A Guide to Community Development,* rolled off the presses at Nilokheri in January 1957. Containing a glowing preface by Dey who had recently been elevated by Nehru to the post of Minister of Community Development, the guide served as a handbook for training extension worker who would in turn educate village-level workers and villagers themselves. Dey and Ensminger's handbook represented the accumulated development training expertise of the first four years of the Community Development and National Extension Programs. To clarify the aims of the community development movement, Ensminger introduced the 'Philosophy and Basic Principles of Extension Education' in notably vague terms: "Extension is changing attitudes, knowledge and skills of all the people," he wrote. "Extension is 'learning by doing' and 'seeing is believing.'"[280]

On that note, the guide turned to describe the best methods that rural extension workers should employ to impart their knowledge to villagers. Ensminger suggested that extension workers introduce new concepts of improved farming methods and sanitation through the use of visual aids such as film strips, flash cards, puppets, and

[279] Ibid.
[280] Ensminger, 7.

"flannelgraphs."[281] The flannelgraph, he explained, was a Ford Foundation innovation employing strips of flannel felt on a bulletin board. The strips could be arranged into pie charts and bar graphs along with drawings and photographs to illustrate numerical data regarding crop yields and budget management in an accessible way. Ensminger waxed poetic concerning the proven effectiveness of the method in communicating critical information, but he cautioned meticulous extension trainees: "YOUR FLANNELGRAPH DOES NOT HAVE TO BE PRETTY."[282] With these teaching tools in-hand, Ensminger and Dey dispatched newly-minted village level workers across rural India as representatives of the National Extension Service.

The community development handbooks distributed by Dey's Ministry of Community Development also stressed strategies and techniques expanding India's food supply through a broader engagement of village populations. Published in October 1958, *The Gram Sevak's Guide for Increasing Agricultural Production* offered a condensed, print version of the training exercises being perfected at Nilokheri. In particular, the guide emphasized instruction in the use of insecticides, chemical fertilizers, and high-yield seed varieties within development blocks. To that end, the official handbook encouraged village workers to provide visual instruction to farmers, following up with verbal tests to confirm comprehension.

Perhaps addressing concerns over the shortcomings of community development initiatives, *The Gram Sevak's Guide* also devoted an entire chapter to the engagement of village women. As the handbook indicated: 'Each mother wants the very best for her children. You must use this interest to bring about the changes necessary for improved

[281] Ibid., 37.
[282] Ibid., 44.

agriculture which will then improve family living.'[283] Further, the guide instructed village-level workers to encourage local mothers to alter their cooking practices to maximize the nutritional value of certain foods and to add milk and vegetables into meals, thus relieving the reliance upon food grains. In this way, village-workers could appeal to motherhood to advance the cause of increased agricultural production for the nation. Community development's engagement of village women represented a means to the end of ensuring India's food security, but such training texts remained largely silent regarding the education or empowerment of women as agricultural experts or primary cultivators themselves.

TERMINATING THE EXPERIMENT

With Dey's Ministry of Community Development reaching over 200,000 of India's 580,000 villages through rural extension efforts by 1957, the humble program begun at the Kurukshetra camp attained almost unrecognizable bureaucratic dimensions (Ensminger 1957, i). Nevertheless, the wide community development collaboration between the Government of India and the Ford Foundation remained grounded in the principle that vocational training and work were all that India's villagers needed to thrive. Anyone could be trained and educated in this optimistic model, be they refugees from West Pakistan, farmers from Uttar Pradesh, or bureaucrats from Calcutta. That said, internal criticisms of India's community programs had already begun to build.

In 1955, for instance, the Planning Commission's second annual review of the initiatives of the Community Projects Administration found that the community development push had failed to engage village women in any meaningful way: 'In most places, lack of clear-cut programs for women is the main reason why they remain more or

14. "The Gram Sevak's Guide for Increasing Agricultural Production," 1958, Ford Foundation Grants to Grants E-G – Government of India (05200061), Microfilm Reel 3454, FF, RAC.

less untouched by these [community development] activities.'[284] Although generally positive about the community development concept, the Planning Commission concluded that dedicated resources for village women remained rare in most development blocks, resulting in their exclusion from programming. This limited approach, the Commission found, could promote gender inequities and social injustice on a large scale.

Two years later, the Government of India enlisted Balwantrai Mehta, the Gujarati politician who would design the decentralized framework of Panchayati Raj, to assess India's Community Development and National Extension Service programs. Mehta and his team concluded that the programs had largely neglected practical improvements in agriculture and had focused far too heavily on welfare provision in the villages. More importantly, Mehta contended, community development had evolved over four years to become a scheme of bureaucratic centralization with the program's chosen experts wielding far too much local decision-making power.[285]

The 1957 Mehta Report marked the beginning of a shift in public and official opinions of community development in India, prompting calls for the decentralization of rural development projects. With the community development initiative requiring frequent reports from its local representatives and decisions filtering down from the Ministry of Community Development's central office, the report explained that the ministry had drawn too much power into New Delhi. As Mehta wrote: "There has to be an act of faith in democracy."[286] Further, Dey himself conceded that overlapping responsibilities to various government agencies and ministers compelled many village-level workers to file nearly

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[284] Programme Evaluation Organisation, 19.
[285] Government of India Committee on Plan Projects, *Report of the Team for the Study of Community Projects and National Extension Service, Vol. 2* (New Delhi: Government of India, 1957), 6-8.
[286] Staples, 13.

three hundred reports on the most basic aspects of their work per year.[287] In this way, even the founder of India's community development program recognized its bureaucratic tendencies. As official interest waned in the wake of the Mehta Report and the actual impact of India's community development push came under further scrutiny, funding for such programming wound down through the early 1960s and the Ministry of Food and Agriculture ultimately absorbed Dey's Community Development Ministry in 1966.

CONCLUSION

For Nilokheri, the end of community development's heyday in India during the 1950s and early 1960s did not necessarily spell its doom. Dey's direct oversight of the project ended by the mid-1950s as his official career at the Central Secretariat in New Delhi gained traction. By early 1961, over eight thousand people lived in the township, no longer an exclusively refugee population. As Dey recalled, with the withdrawal of direct government funding for artisanal and agricultural production, unemployment rose to over seventy per cent, approximately matching average figures for the surrounding countryside.[288] Despite torrential floods in 1957 and devolution of town management to the state government of Punjab and then to Haryana, the town remained a national hub for rural extension training and education. Nilokheri continued to host the Extension Education Institute, the Social Education Organisers' Training Centre, the Orientation and Study Centre, and the Punjab Polytechnic into the early 1960s – three of which remain important regional institutions today.

With its legacy in post-Partition refugee rehabilitation, national extension efforts and the community development movement in India contributed to the systems of knowledge sharing and rural organization associated with the Green Revolution of the late

[287] Ibid.
[288] Dey, 54.

1960s and 1970s. As Abid Hussain, Indian economist and ambassador to the United States, wrote of the 'technological model' that characterized the Green Revolution:

> What has been forgotten by most commentators is that this technological model would not have successfully diffused in the country were it not for the infrastructure built so carefully by S. K. Dey and his dedicated band of followers in the 1950s. It is village and block-level infrastructure built up under the community development program that has served as a delivery system.[289]

The origins of the post-independence push toward agricultural development and rural extension drew significantly upon the crisis management work of India's Ministry of Rehabilitation. Over the decade following Partition, the Government of India's emphasis on community development would shift toward a focus on increasing food production, through social and then scientific and technological investments.

As the sheer bureaucracy of the new Ministry of Community Development hampered its progress in the early 1960s, the Ford Foundation's own philanthropic priorities shifted toward funding direct innovations in agricultural science and agronomy to pursue the coveted goal of exponentially greater grain yields.[290] Nevertheless, S. K. Dey's national community development program influenced the evolution of Panchayati Raj — modern India's system of decentralized village governance — and established lasting institutions of agricultural knowledge sharing and rural extension training. These efforts had been informed and shaped by the experience of rehabilitation.

The entry of American philanthropic organizations, planners, and scientists onto the scene during the 1950s accelerated the process of reshaping rural India along lines geared toward ever greater production of food grains. Further, they connected India into a growing global networked focused upon addressing the perceived postwar population crisis through wide-ranging community development initiatives. As Andrew Zimmerman has

[289] Staples, 14.
[290] Ibid.

observed of the earlier promise of agricultural modernization forwarded by the scientists of the American Tuskegee Institute as they sought to extend cotton production in German-administered Togo in 1901: "Agriculture had always involved modification through selection, and the global commodities markets of the nineteenth century expanded this ancient element of agriculture into a means of labor coercion."[291] Much the same could be said of food grain cultivation in the mid-twentieth century. Further, given the influence on the GEB's work in the American South upon the agenda of the Allahabad Agricultural Institute under Sam Higginbottom and later Arthur T. Mosher, rural extension efforts descended from an impetus to make cash cropping more productive and, in turn, more lucrative. Transcending both racial and political boundaries, the economic imperative for a regimented agricultural labor force to meet the needs of production emerged in East Punjab and West Bengal in the 1950s, just as it had in Togo in the early 1900s and in the American South before that.

The trajectory of community development in India and its legacy in the contentious interventions of the later Green Revolution can be more fully understood in the specific context of Partition, independent India's refugee crisis, and the perceived pressures both placed upon the new nation's ability to feed its growing population. The Nilokheri experiment began under the banner of Mazdoor Manzil at the Kurukshetra refugee camp in the direct aftermath of Partition. Dey's conception of Mazdoor Manzil as an ideal of cooperative learning, hard work, and self-reliance transplanted easily from the chaos on that epic battlefield into the fertile ground of the global community development movement. Yet, for all the optimism of subsequent community development initiatives and the ambition of India's nationwide effort to transform average citizens into extension

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[291] Andrew Zimmerman, *Alabama in Africa: Booker T. Washington, the German Empire, and the Globalization of the New South* (Princeton, NJ: Princeton University Press, 2010), 17.

experts, state-led community development in the vein of Nilokheri began first and foremost as an effort to convert Partition's refugees into productive agriculturalists.

Chapter Three: Nourishing the Body

Born in Calcutta to a prominent family of educators, civil servants, and Brahmo Samaj reformers in 1904, Renuka Ray became a devoted follower of Mahatma Gandhi at the age of sixteen. At Gandhi's urging, she read for her B.Sc. at the London School of Economics and returned to India in 1921 to begin her work with the All India Women's Conference. After representing India's women in both the Central Legislative Assembly and the Constituent Assembly of India during the final decade of British rule, Ray dedicated herself to the millions of refugees displaced from East Pakistan.[292] As Minister of Relief and Rehabilitation in the Government of West Bengal from 1952 to 1957, she worked to secure homes and employment, effectively managing the state's transition from rehabilitation to community development programming.[293] Now a member of the Lok Sabha and chair of the Ministry of Health's 1960 School Health Committee, Ray turned her attention to ensuring that children received nutritious daily meals in schools across India. In addition to Ray, the committee included the nation's top nutritional scientists and dietitians, including C. Gopalan of the Nutrition Research Laboratory in Hyderabad, Muktha Sen of the All-India Institute of Hygiene and Public Health in Calcutta, and M. Swaminathan of the new Central Food Technological Research Institute in Mysore. Decades of research at their respective institutions left the solution to the problem of malnutrition among India's schoolchildren abundantly clear. As Ray wrote in an article in the *Illustrated Weekly of India* in October 1961:

> A school meal must necessarily make use of locally available food-stuffs and should provide approximately 1/3 of the dietary and nutritional requirements of

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[292] Ray, 5-8.

[293] Renuka Ray, "History of Social Reform and Social Work from 1947 to 1963," 1963, Folder 59, Speeches and Writings by Renuka Ray, Renuka Ray Papers, NMML.

> the child. This is the opinion of the nutritional experts who have been working in different experimental centres and laboratories.[294]

Indeed, Ray continued, nutritional scientists at the Nutrition Research Laboratories had determined that daily meals at a cost of only twelve new paise could provide schoolchildren with the minimum calories needed to support healthy growth.[295] At just over one-tenth of one Indian rupee per day, the sum seemed a small price to pay to see India's schoolchildren into adulthood. Further, Ray's advocacy for school meals in India reflected a broader global trend in attending to the nutritional needs of children in an educational setting. In Britain, for instance, the Education Act of 1944 required that local authorities provide resources for school meals.[296] This innovation came as an echo of what James Vernon has called the "humanitarian discover of hunger" and served as a vital site of nutrition planning in postwar Britain and the United States.[297]

In addition to humanitarian imperatives, Ray emphasized a higher motive behind the need for state intervention in feeding the nation's youth. As she wrote: "Once our children are given the opportunity to build up healthy minds and healthy bodies, it will be through their effort that we shall be able to generate wealth and welfare for our nation."[298] In conceiving of India's children as the offspring of the entire community, Ray cast the young themselves as an economic resource, a vital means by which the nation could ensure its prosperity and security for decades to come. Ray's association of the nutritional welfare of vulnerable populations—including children, pregnant women, and the poor—with the overall material progress of the young nation echoed the concerns and findings of

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[294] "Draft of 'Health and Nutrition of the School Child in India' by Renuka Ray," October 24, 1961. p. 2, Speeches and Writings by Renuka Ray. Folder 50, Renuka Ray Papers, Individual Collections, NMML.
[295] Ibid.
[296] Vernon, 164.
[297] Ibid., 174-175.

nutritional scientists and dietitians working across South Asia during the two decades following the Second World War. During this period, the Government of India collaborated with the Rockefeller Foundation, the Food and Agriculture Organization of the United Nations (FAO), and the World Health Organization (WHO) to deploy the nutritional sciences in the quest to both identify and eliminate the chief causes of malnutrition across the nation.

These efforts built upon a colonial scientific legacy, drawing directly from the investigations and methods pioneered in India by D. McCay and Robert McCarrison through the 1910s and 1920s at Calcutta's Medical College and the Nutrition Research Laboratories at Coonoor, respectively. McCay's work offered a "scientific, nutrition-based rationale for the martial races theory" that effectively identified dietary proteins—and not heredity, race, or climate—as the primary driver of differences in human physique.[299] In South India, McCarrison's efforts identified vitamin deficiency as the cause of beriberi and goiter and also corroborated McCay's earlier theories through experiments with laboratory rats.[300] As David Arnold rightly notes of the nutritional sciences as they grew up during the late colonial era, "Although developments in India were obviously contingent upon metropolitan concerns […] the uses to which nutritional ideas were put and the contexts in which they were examined and applied owed much to local circumstances and perceptions."[301] Much the same could be said of the intellectual descendants of these nutritional notions as they matured in South Asia during the Second World War, past independence, and through the 1950s.

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[299] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India," 15.
[300] V. N. Patwardhan, *Nurtition in India* (Bombay: Dr. J.C. Patel for the Indian Journal of Medical Sciences, 1952), 1-2.
[301] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India," 26.

This chapter examines how investments made in India by the Rockefeller Foundation and the FAO following the war transformed and amplified the capacity of the nutritional sciences in India, while interacting with specific local concerns and contexts. The exchange of scientific knowledge and expertise that followed profoundly shaped the public health priorities of both Rockefeller and the FAO. Into the 1960s, the laboratory unfolded into the field as nutritional and agricultural scientists became increasingly engaged with one another's efforts. Beyond financing wider investigations into the diseases of deficiency-related malnutrition, Rockefeller and FAO helped to draw India's nutritional research institutions further into a widening global network of scientific expertise. The research agenda set out by late colonial nutritional scientists would come to interact closely with the priorities of the production-focused brand of agricultural science advanced by the Rockefeller and Ford foundations through the 1950s and 1960s. At the same time, scientists at the Nutrition Research Laboratories at Coonoor and the All-India Institute of Hygiene and Public Health in Calcutta vigorously pursued a focus on childhood and maternal nutrition, as well as the dietary health of the rural laborers and the poor. Bolstered by the financial support of the Rockefeller Foundation and the FAO, these inquiries converted vulnerable populations into unwitting subjects upon whom new notions of nutritional health could be tested.[302]

SURVEYING NUTRITIONAL HEALTH

Gathering physiological, socioeconomic, and dietary data on India's population was a central priority of the nutritional scientists from their first dedicated explorations of

[302] Indians, of course, were not the only subjects of such population-wide experiments supported by American philanthropic organizations during this period. As Alexandra Minna Stern, James Vernon, Nancy Leys Stepan, and Steven Paul Palmer have shown, studies of population and nutrition cropped up regularly through the mid-twentieth century in contexts as varied as the American Southwest, Britain, Latin America, and the Caribbean, among others.

diseases of deficiency in India in the 1910s and 1920s. As Kenneth J. Carpenter has shown, rapid developments in the identification of vitamins (or "vital amines" as they were first labeled by Polish biochemist Casimir Funk in 1911) propelled scientific explorations of deficiency diseases like pellagra, scurvy, and rickets across Europe, the Americas, and, increasingly, Asia.[303] Owing to rapid advances in biochemical research and nutritional survey methodologies in Europe and the United States, as well as the burgeoning recruitment of physicians, chemists, and biologists into the nutritional sciences around the globe, the 1930s came to be known by later nutritionists as "the golden age of nutrition."[304] Indeed, in colonial India, the British administration established the Indian Research Fund Association in 1911 to coordinate and finance medical research across the subcontinent. The Association would come to play a central role in coordinating nutritional research across India during the interwar years and beyond, itself receiving regular financial support from the Rockefeller Foundation.[305] Through the 1930s, the Indian Research Fund Association contributed a lakh of rupees annually toward emerging nutrition research at two institutions: the All-India Institute of Hygiene and Public Health in Calcutta and the Nutrition Research Laboratories at Coonoor in the southern reaches of the Madras Presidency.[306]

Well into the 1940s, the two institutions represented colonial India's only dedicated centers for laboratory and field research in the nutritional sciences. Both drew upon the legacies of the physiologist McCay and the physician McCarrison, with the All-India Institute emphasizing field research and the Nutrition Research Laboratories at Coonoor

[303] Carpenter, 3023.
[304] Ibid., 3031.
[305] Patwardhan, 2.
[306] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India,"18.

focusing on laboratory and clinical investigations.[307] While McCay pursued field investigations of diets and nutritional health in Bengal's jails, laboratory research stood at the center of McCarrison's influential vision of the emerging nutritional sciences. Beginning in the mid-1940s with increased colonial funding for evaluations of India's health status, the use of surveys featured prominently within the efforts of nutritional scientists and dietitians at the All-India Institute. Scientists employed nutrition surveys, in which the physiological states of patients were assessed—whether through physical measurement, visual observation, or biochemical analyses. Diet surveys were also employed to determine not just what kinds of food Indians ate, but when and how much they consumed of them and how they prepared their meals.[308]

Though based in Calcutta, the All-India Institute of Hygiene and Public Health (AIIH&PH) maintained an expansive research unit in the countryside, just twenty miles northwest of the city. Termed the Singur Health Unit, the area was not a discrete "unit" of any explicit design, but rather a swath of the Bengali countryside, consisting of eight distinct villages separated by rice paddies and marshes—an ideal sample area in which to conduct rural health research.[309] In 1944, the Singur Health Unit covered a population of about 63,000 and consisted of the four Union Boards of Singur, Balarampati, Bora, and Begumpur.[310] Established in December 1943 as a joint venture of the colonial Government of India and the provincial Government of Bengal, the Health Unit provided the physicians, biochemists, and public health experts of the All-India Institute with a dedicated venue in which to train, practice medicine, and conduct large-scale surveys and experiments in rural

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[307] Patwardhan, 2-3. The Indian Research Fund Association would be renamed the Indian Council of Medical Research (ICMR) following independence in 1947.
[308] Ibid., 154.
[309] "India: The Singur Study," *Studies in Family Planning* 1, no. 1 (1963): 1.
[310] R. B. Lal and S. C. Seal, *General Health Survey, Singur Health Centre* (Calcutta: Government of India Press, 1949), 201.

health. Incidentally, AIIH&PH investigators noted that while the Singur study area did not suffer disproportionately from the effects of the famine that devastated the eastern Bengali countryside, the food crisis did prompt institute officials to introduce a system of rationing in rice, *atta*, salt, and sugar for the residents of Singur, Balarambati, Bora, and Begumpur.[311]

In 1949, R. B. Lal, director of the institute, and S. C. Seal, the institute's secretary, described the Health Unit's primary purpose as the "coordination of curative and preventive functions under a single administration in order to achieve the maximum results."[312] In this way, the Singur Health Unit offered an ideal venue in which the experts of the All-India Institute could develop practical medical skills and train in the observation and experimentation methods associated with preventive medicine. As Lal and Seal noted:

> The Singur Health Unit provides […] a controlled rural community field for investigation and for teaching of public health analogous in function to the provision to pre-clinical sections of a medical college their own laboratories and to clinical sections of their own teaching hospitals. In addition, it provides the opportunity to investigate the best ways of applying the results of medical knowledge to the requirements of rural units of population within existing economic practicability.[313]

More than enabling a convenient convergence of curative and preventive methods, the Singur area also offered a set of communities that could be demarcated as experimental and control groups, to enable a clearer scientific understanding of rural India's health challenges and, more specifically, the relationship between rural poverty and the prevalence of diseases of deficiency.

In theory, experiments conducted upon Singur's "controlled rural community" would illuminate how dietary deficiencies could affect whole populations within India.

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311 Ibid., 79-80.
312 Ibid.
313 Ibid.

With the rising prominence of the nutritional sciences through the 1940s, malnutrition and diseases of deficiency marked one of the chief fields of study for the All-India Institute scientists and physicians conducting their work in the region. Indeed, nutritional health played an implicit role in all the scientific investigations carried out within the study area. For the purposes of studies conducted through the Singur Health Centre, the study's chiefly Bengali investigators defined a family simply as a "unit having a common kitchen."[314] Whether a family was 'single' or 'joint' would be determined by the actual relationships at-hand, but the kitchen provided the focal point around which All-India Institutes surveyors grouped all families. In this way, communal eating and cooking habits proved central to researchers' understanding of how communities functioned and how population groups could be compared to one another. Further, the investigators' definition of a family as centered around a kitchen — presumably in which women would do the bulk of the cooking — seemed to foreshadow Renuka Ray's nationalistic notion of women's homemaking as vital to the nation as "home is the nucleus of the nation."[315]

The 1944 study of nutritional health in the Singur area concluded that vitamin deficiencies were widespread among the villagers.[316] Although biochemical analyses proved impracticable in the study's first round for lack of adequate laboratory facilities, All-India Institute surveyors relied on systematic clinical examinations to record the visible effects of such deficiencies. Employing clinical methods such as weighing and measuring bodies, as well examining eyes, hair, teeth, and fingernails, surveyors estimated percentages of the population suffering from iron and vitamins A, B, C, and D deficiencies. With these rough methods and observation techniques, surveyors concluded that nearly

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[314] Ibid., 262.
[315] Renuka Ray, "Women as Citizens of Free India," July 6, 1951, p. 4, Folder 14, Speeches and Writings by Renuka Ray, Renuka Ray Papers, NMML.
[316] Lal and Seal, 118.

forty percent of the Singur Health Unit's population suffered from some degree of malnutrition.[317] With these rough but sobering estimates, Lal and Seal speculated as to the causes of each of these deficiencies, particularly among the children of the study area. As they wrote: "Racial factors, heredity, etc., may also contribute to their shares, but there can be little doubt that a great deal can be done towards bringing the inafnts (sic) and children nearer to passable standards..."[318] In this way, racial and eugenic thinking regarding the causes of deficiencies lingered in the minds of the nutritional scientist of the All-India Institute as late as 1949, but the simple notion that much could be done to improve such outcomes through changes in diet prevailed.

In late 1944, the Rockefeller Foundation's board of scientific directors voted to finance the on-going study of nutritional conditions in the Singur Health Unit in the wake of the catastrophic famine that swept the province from 1943 to 1944. In cooperation with the All-India Institute of Hygiene and Public Health, Rockefeller's earliest venture into nutritional surveying in late colonial India centered on the Singur Health Unit. Meeting in New York in October 1944, the scientific directors of the Rockefeller Foundation's International Health Division (IHD) approved a three-year commitment to this new collaboration with the All-India Institute. At just $4,455 with similar contributions over the next three years, Rockefeller's financial contributions to the study hardly represented a mammoth investment. At the same time, the move to supplement the ongoing nutritional research in Bengal diverged from the IHD's running focus upon ringworm and malaria control in South Asia. Discussing malnutrition as a major under-investigated public health concern in colonial India, the directors emphasized that the lessons to be drawn from such work could be transferred to other national contexts around the world. As they noted,

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[317] Ibid.
[318] Lal and Seal, 115.

"Nutrition and malnutrition are probably more significant public health problems in India than in any other country. Diet surveys have been carried out in different regions but only through the rough techniques of either diet or weighing."[319] Such clinical and dietary surveys, Rockefeller's scientific directors concluded, needed to be complemented with further population studies based upon "biochemical and other more refined techniques" to provide a standard against which existing data might be assessed.[320] Patchy colonial measurements could thus be refined and merged with more robust scientific data, enabling definitive conclusions about the state of India's nutritional health.

To that end, the scientists at the All-India Institute of Hygiene and Public Health drew upon a recent precedent in nutritional surveying in an important study recently conducted in Britain by Oxford physiologist Hugh Macdonald Sinclair and funded by the Rockefeller Foundation. The Oxford Nutrition Survey, as it came to be known, represented a groundbreaking investigation of the nutritional deficiencies prevalent under Britain's wartime food rationing regime.[321] In particular, Sinclair's survey involved biochemical assessments of population groups considered most likely to suffer from malnutrition, such as children, pregnant women, the elderly, and the poor. In Oxford, for instance, two groups of working-class women and their newborn children were evaluated by researchers in 1942 and 1944.[322] The study involved the distribution of dietary questionnaires and the analysis of blood and urine samples. Among pregnant working-class women in particular, biochemical analyses indicated significant deficiencies in vitamins A and C, with similar

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[319] "Minutes of Meeting on the All-India Institute Nutrition Survey," October 26-27, 1944, Folder 1, Box 1, Series 464, RG 1.1, Projects, RF, RAC.
[320] Ibid.
[321] Rachel R. Huxley; B. B. Lloyd; M. Goldacre; H. A. W. Neil, "Nutritional Research in World War 2: The Oxford Nutrition Survey and Its Research Potential 50 Years Later," *British Journal of Nutrition* 84 (2000), 247.
[322] Ibid., 247-248.

deficiencies in iron and protein. In response to these findings, Britain's Ministries of Health and Food began distributing orange juice and cod-liver oil to pregnant women in 1942. The ministries replaced these supplements with vitamin tablets containing vitamins A and D in early 1943, and ultimately added in extra rations of milk, eggs, and meat for new and expectant mothers and their infants.[323] In this way, the Oxford Nutrition Survey offered the nutritional scientists and dietitians of the All-India Institute a clear set of best practices, not only for conducting large-scale studies among at-risk populations, but for channeling their findings into concrete welfare policies.

While the survey conducted in Singur in 1944 and 1945 by the All-India Institute represented the first such project supported by Rockefeller in South Asia, the foundation had financed similar initiatives tracking the connection between privation and malnutrition during the Second World War and in its immediate aftermath. The majority of such studies investigated maternal, infant, and childhood nutrition, as well as clinical cases of deficiency diseases such as goiter, rickets, and pellagra. Beyond the Oxford Nutrition Survey, the Rockefeller Foundation also coordinated survey-based research into the pre- and postnatal nutrition of mothers at the Tacuba Health Center in Mexico City.[324] Through the IHD, Rockefeller also financed nutritional health surveys of schoolchildren in North Carolina and Tennessee during the war years. Finally, as the First Canadian Army fought to expel German forces from the Netherlands in the early months of 1945, the Rockefeller Foundation moved in to collaborate with the Netherlands Military Administration in an extensive survey of famine-stricken areas of the country. In the Netherlands, Rockefeller supported the establishment of street clinics to ascertain average caloric intake values among the population—the figure stood between 800 and 1,000 calories per day in April

[323] Ibid., 249-250.
[324] "The Rockefeller Foundation Annual Report, 1945," 1946, 76, RG 16 (FA120), Reel 14, RF, RAC.

1945.[325] Strikingly, the work of such street clinics in the war-torn Netherlands provided researchers with a wide population sample, permitting a rare expansion beyond nutritional scientists' usual focus upon maternal, infant, and childhood nutritional health.

UNFOLDING THE LABORATORY INTO THE FIELD

Determined to build upon the methods pioneered in the Oxford Nutrition Survey, the Rockefeller Foundation enthusiastically endorsed the methodologies of the Singur Nutrition Survey in 1945. A Rockefeller-financed study launched in 1942 in the working class, industrial towns of Accrington in Lancashire, Merthyr and Tydfill in Wales, and the Borough of Chesterfield in Derbyshire provided the conceptual basis for the nutrition survey of Singur.[326] This survey had gathered and assessed nutritional data from 50 families, or roughly 200 individuals, and corresponded with an investigation into the socioeconomic and housing conditions of each family.[327] All-India Institute surveyors also collected biochemical samples (urine and blood) across the study area to permit physiological comparisons between different socioeconomic groups. In the Singur Health Unit, careful studies of the living conditions and financial considerations of the impoverished farmers and villagers who made up the bulk of the sample enabled Lal and Seal to create the profile of an 'average' villager living in the study area. As they wrote:

> Food absorbs nearly 90 per cent of the total money value available for consumption and little is left for other expenses. Of the main items other than food, fuel and lighting, interest on loans and taxes take away the major part. Money spent on education is negligible, but medicines and medical advice claim an appreciable share in the family budget. No comments are necessary to emphasise the point that sheer necessities to keep body and soul together take away all that the poor man can manage to spend on himself.[328]

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[325] Ibid., 75.
[326] "Proposals for Survey of Nutritional Conditions in Selected Area of Singur Scheme," November 1944, Folder 1, Box 1, Series 464, RG 1.1, Projects, RF, RAC.
[327] Ibid.
[328] Lal and Seal, 96.

With this profile derived from the basic questions regarding the living conditions in the study area, the Rockefeller-funded All-India Institute began to forge a more holistic understanding of the causes of nutrition-related illness. Scarcely able to purchase enough food, villagers could hardly be expected to procure the right kinds of food with which to stave off deficiencies and malnutrition.[329] Beyond providing methodological inspiration and prompting the inclusion of an emphasis upon material living conditions within the Singur nutrition studies, Sinclair's Oxford Nutrition Survey also lent the All-India Institute and the Rockefeller Foundation the tools necessary to field a comparable study in rural India. In October 1944, Rockefeller's board of scientific directors specifically referenced the work of A. P. Meiklejohn, an Oxford-trained dietitian who collaborated with Sinclair in developing the mobile scientific units deployed during the survey.[330] The mobile unit model would be employed in Singur to enable the All-India Institute's researchers to more effectively collect biochemical samples in rural settings, thus transporting the nutrition laboratory into the field.

Scientists working on the nutritional surveys of the Singur Health Unit at the end of the Second World War referred to extensive laboratory research conducted over two decades in South India, exploring the connections between diet and diseases of deficiency. The assumptions and conclusions of the body of laboratory work pursued at the Nutrition Research Laboratories at Coonoor would significantly shape nutritional surveying in Indian in the postwar era. Seemingly a world away from Singur and the alluvial plains of rural Bengal, the Nutrition Research Laboratories sat high in the Nilgiri Mountains of the southern Madras Presidency in modern-day Tamil Nadu. Beginning as a one-room unit of

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[329] Ibid.

[330] "All-India Institute Singur Nutrition Survey Designation," October 1944, Folder 1, Box 1, Series 464, RG 1.1, Projects, RF, RAC.

the larger Pasteur Institute of Southern India, the Nutrition Research Laboratories originated with Robert McCarrison's initial studies of beriberi in 1918.[331] The institution grew haltingly through the 1920s as a research division dedicated to the study of beriberi and then of deficiency diseases more generally, including goiter and other thyroid disorders. By 1927, McCarrison's division had grown large enough to justify its separation from the Pasteur Institute as an entirely new institution.[332] With financing from the government of the Madras Presidency and the Indian Research Fund Association, McCarrison formally dedicated the new institution to the investigation of nutritional health across India, including "the study of the Agricultural aspects of Nutrition" and "the determination of the food values of various food materials in general use in India."[333] First and foremost, however, the Nutrition Research Laboratories would be dedicated to the identification of the causes of malnutrition across India.

While the emergent nutritional sciences acknowledged concerns regarding overpopulation, nutritionists like McCarrison remained optimistic that dietary changes — and not necessarily radical increases in the food supply — would best promote public welfare. Providing testimony to the field team of the Royal Commission on Agriculture in India that visited Coonoor in 1927, McCarrison defined malnutrition as "the impairment of the normal physiological processes of the body consequent on the use of a food which is deficient in quality although it may be abundant in quantity."[334] This notion of correcting deficiency, both in diets broadly and particular food items more specifically, guided successive investigations at the Nutrition Research Laboratories through McCarrison's

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[331] "'Nutrition Research Laboratories: A History of its Origin, Development and Activities' by V. N. Patwardhan," 1950, p. 6, Folder 381, Box 44, Series 464A, RG 1.2, Projects, RF, RAC.
[332] Ibid.
[333] Ibid., 7.
[334] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India,"19.

tenure as director of the institution and long after his retirement in 1935.[335] As Sunil Amrith argues, "Although the nutritional thought of the 1930s touched upon concerns about India's growing population, the emphasis on nutrition and sanitation worked, in many cases, *against* the popular claims of eugenicists."[336] The nutritional sciences placed great emphasis upon the resolvable nature of diseases of deficiency. Cases of rickets could be prevented with sufficient vitamin D; instances of stunting could be averted with adequate maternal and infantile nutrition. Indeed, nutritional surveys commissioned between 1935 and 1945 by McCarrison's successor, W. R. Aykroyd, lent further credence to emerging theories regarding the dietary origins of the physiological differences between Indians. Such hypotheses seemingly undermined eugenic notions of race and environment as crucial factors in determining differences in stamina and physique.

Viewed as essential to correcting the deficiencies and malnutrition that threatened the health of India's population, the Nutrition Research Laboratories worked to compile a bulletin of common Indian foods and their corresponding nutritional values. Originally written by Aykroyd in 1939 and based upon the laboratory investigations performed at the Coonoor facilities, *The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets* offered both a long list of tables including detailed biochemical information for common food items and straightforward explanations of the significance of each known vitamin and nutrient.[337] The bulletin also provided extensive expositions of exactly what laboratory research in India had revealed about the connection between particular deficiencies and related diseases. Though highlighting the intrinsically poor quality of

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[335] "'Nutrition Research Laboratories: A History of its Origin, Development and Activities' by V. N. Patwardhan," 1950, p. 15-18, Folder 381, Box 44, Series 464A, RG 1.2, Projects, RF, RAC.
[336] Amrith, *Decolonizing International Health: India and Southeast Asia, 1930–65*, 45.
[337] W. R. Aykroyd, C. Gopalan, and S. C. Balasubramanian, *The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets*, 6th ed. (New Delhi: Indian Council of Medical Research, 1963), vii.

certain foods and the detrimental effects of particular cooking processes upon nutritional values, Aykroyd's bulletin revealed that the study of deficiencies also proved particularly optimistic concerning the ability of science to improve the quality of India's food supply. In studies conducted at the Nutrition Research Laboratories, McCarrison found in 1928 that rice grown by the dry crop method was superior in nutritional quality to rice grown in water.[338] At the same time, his colleague A. Sreenivasan concluded through tests on albino rats conducted in 1942 that his esteemed former director had been wrong and that "wet rice" was indeed superior, containing greater amounts of protein and minerals and prompting an "immediate growth response" in the test animals.[339]

Through laboratory investigations into rice quality, Aykroyd evaluated specific methods of cooking India's primary staple grain, pushing McCarrison and Sreenivasan's work even further. Tests conducted at the Nutrition Research Laboratories revealed that the common practice of parboiling rice, that is, steaming the raw grain under pressure to split the husks in preparation for drying and milling, did not greatly affect the nutritional quality of the grain as scientists had earlier speculated. Instead, the parboiling process enabled the remaining grain to absorb many of the vitamins contained in the nutritious husk that, as in the case of polished or white rice, was immediately stripped away.[340] Indeed, laboratory analyses directed by Aykroyd through the late 1930s confirmed that the parboiling process enabled the rice to maintain much of its thiamine, thus making it an ideal method of countering the deficiencies underlying cases of beriberi.[341] To supplement these laboratory investigations into the nutritional content of common food grains, Aykroyd also launched a series of regional surveys of consumption habits and

[338] Patwardhan, 19.
[339] Ibid.
[340] Aykroyd, Gopalan, and Balasubramanian, 12.
[341] Ibid.

physiological outcomes across India.[342] These studies concluded that "the diet of the poor rice eater is much the same all over India…ill-balanced and does not contain enough of the non-cereal foods rich in the nutrients needed for health."[343] As such, Aykroyd commented, proper milling and preparation methods proved essential to retaining the nutritive quality of the staple grain. Confirming the explanatory power of the broad surveys conducted by the Nutrition Research Laboratories, the biochemist Vinayak Narayan Patwardhan wrote that Aykroyd's surveys of study groups selected from a diverse set of locations across India "obtained a fairly representative sample of Indian dietary habits, and by their investigations showed up the basic similarity in the pattern which the dietary of the poor Indian followed whether he was from Kashmir, Bengal or Madras."[344] In this way, while the emergent nutritional sciences acknowledged concerns regarding overpopulation, nutritionists like Aykroyd and Patwardhan remained optimistic that dietary changes—and not racialized efforts at population control — would best promote public welfare.

At Singur, the practical implications of the laboratory-driven survey work perfected at Coonoor had proved invaluable in assessing levels of malnutrition in the Health Unit. In their training in fieldwork methodologies, nutrition researchers learned to spot the iron and vitamins A and C deficiencies prevalent across the Health Unit — knowing that such conditions were closely associated with low metabolic activity which resulted in "lowered resistance to infectious diseases"[345]. Such work, however, proved less effective in changing the dietary habits of the Bengali villages surveilled by AIIH&PH scientists both in the villages and at the Public Health Laboratory set up to perform biochemical analyses of

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[342] W. R. Aykroyd, *Note on the Results of Diet Surveys in India, Burma and Ceylon* (Cawnpore: Job Press, 1948), 3.
[343] Ibid.
[344] "'Nutrition Research Laboratories: A History of its Origin, Development and Activities' by V. N. Patwardhan," 1950, p. 16, Folder 381, Box 44, Series 464A, RG 1.2, Projects, RF, RAC.
[345] Lal and Seal, 190.

collected specimens in Singur in 1944.[346] In their guide for health investigators from the All-India Institute, Lal and Seal stressed that, in delving into the lives and dietary habits of the members of the family units within the Singur area, nutritional scientists and investigators would first need to "probe, even though superficially, into their psychology."[347] New developments in the nutritional sciences, Lal and Seal observed, provided an "intelligent guide" for Indians making daily decisions about their health. That said, the two Calcutta-based nutritionists argued that the practices of even the best-informed of India's villagers hindered progress in improving the nutritional health of the broader community. Health investigators and physicians working in the survey area should thus be wary of deviations from prescribed nutritional regimes among the subjects of their investigations. As Lal and Seal wrote:

> [T]he investigator should be able to judge whether the light of newer knowledge of nutrition is beginning to enlighten thought and behaviour in supercession of tradition and prejudice. Thus, for instance, a man with knowledge may not select the correct article of food when both the right and the wrong types of food are available…[348]

In this sense, the nutritional sciences simply fell short in motivating the strides in public health that Lal, Seal, and other investigators believed necessary to radically improve rural welfare. Ultimately, "tradition and prejudice" derailed efforts at improving nutritional health as new scientific knowledge about healthy eating could not overcome villagers' habits. In their report, Lal and Seal also stressed that "community sense" proved inadequate across the Singur Study Unit. This social deficit, they wrote, displayed itself in the uncleanliness of living spaces and the unsanitary conditions prevalent in communal

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[346] Ibid., 4.
[347] Ibid., 190.
[348] Ibid., 262-263.

areas.[349] In that, officials of the All-India Institute encouraged their investigators to be skeptical of information provided to them by their subjects and confirm their visual assessments with laboratory tools like katathermometers and basic chemical tests.[350] In this way, the anthropometric measurements, diet histories, and spot assessments that had dominated nutritional survey work could now be complemented by ostensibly more accurate laboratory methods.

UNIFYING LABORATORY AND CLINIC

Funded by the Rockefeller Foundation and organized by the All-India Institute of Hygiene and Public Health, the Singur nutrition survey of 1944-1945 placed an explicit emphasis upon identifying nutritional deficiencies among schoolchildren and other groups at risk of malnutrition. Though designed to evaluate school children and vulnerable populations, nutrition indices developed in Europe and the United States, such as Raymond Frazen and George Palmer's Arm, Chest, Hip Index (ACH) and the Knudsen-Schiotz index, proved less useful in India owing to deficits of necessary equipment and staff.[351] Nevertheless, the bulk of nutritional data collected in India up to 1945 had been drawn from successive height and weight surveys of schoolchildren across the subcontinent.[352] To maximize the experimental power of their inquiry at Singur, researchers coordinated their investigation with a new Government of Bengal scheme that provided supplementary lunches to school children in Singur.[353] Over the course of the year, survey workers from the All-India Institute distributed multivitamin pearls donated by the American Friends Service Committee to school children at schools in three of the four union boards in the

[349] Ibid.
[350] Ibid., 264.
[351] Patwardhan, 154.
[352] Ibid.
[353] "Singur Nutrition Survey – Estimates 1946," October 26, 1945, p. 45154, Folder 1, Box 1, Series 464, RG 1.1, Projects, RF, RAC.

study area of the Singur Health Center. The schools in the fourth union board served as the control group and thus did not received the multivitamin supplements. As Rockefeller officials noted the following year:

> The object was to obtain a more definite idea of the extent and nature of prevailing undernourishment, the composition of the diet consumed by families of the school children, their socio-economic conditions and the effect of multivitamin pearls in order to suggest a supplementary diet within available means.[354]

This study of the effects of daily multivitamin supplements upon the health of school children constituted the start of Rockefeller's involvement in the Singur Nutrition Survey. In the first year of the study, researchers concluded that the experimental groups receiving the multivitamin pearls "showed a decided improvement after treatment," whereas the control group displayed deficiencies of vitamins A, B2, C, B1, and B4, in that order of frequency.[355] By means of a follow-up to these initial findings, researchers conducted an economic survey of the living conditions of the families of the vitamin-deficient children. In turn, they found that such families generally displayed deficiencies in total caloric intake and total protein present in biochemical analyses. Further, through dietary surveys, they observed an absence of milk from the diets of vitamin-deficient children.[356]

The methodological gap between the first round of the Singur survey and its Oxford-based predecessor appears striking. Where the Oxford Nutrition Survey presented an analysis of existing nutritional conditions among its working-class participants, the first round of the Singur Nutrition Survey hinged upon the withholding of multivitamin tablets from children receiving free lunches in a government-run school lunch program. In the case of Singur, nutritional scientists from the All-India Institute created experimental and

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[354] Ibid.
[355] Ibid.
[356] Ibid., p. 45155.

control groups out of the young population to determine the efficacy of the multivitamins tablets, thus bringing clinical methodologies into the field study.

The move toward clinical experimentation in investigating nutritional deficiencies in South India began in the mid-1940s with the opening of a nutrition clinic sponsored by the Nutrition Research Laboratories at the Stanley Hospital in Madras.[357] V. N. Patwardhan, or "Pat" as he was known to his colleagues, rose through the ranks of the Nutrition Research Laboratories at Coonoor to succeed Aykroyd as director when the latter departed to direct the Nutrition Division of the FAO in 1945.[358] Through work directed by Patwardhan at the Stanley Hospital, nutritional scientists successfully identified nicotinic acid, riboflavin, and pantothenic acid deficiencies as the culprits behind several common conditions ranging from diarrhea to 'burning feet syndrome.'[359] Owing to these early clinical successes, Patwardhan successful lobbied the Madras government to relocate the entire nutrition clinic to Coonoor in 1947. With sample cases of malnutrition now drawn from the villages of the Nilgiri mountains surrounding Coonoor, the Nutrition Research Laboratories moved forward after independence with a research program that coupled laboratory and survey-based research with extensive clinical investigations of deficiency diseases and their dietary and socioeconomic causes.

For Patwardhan, an adequate understanding of India's nutritional health relied upon basic clinical observations and did not need to involve extensive biochemical surveys of wide population samples. As he wrote in 1951, "[D]eficiency conditions literally stare in one's face in any survey on school children and hence it becomes a luxury to utilize more

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[357] "'Nutrition Research Laboratories: A History of its Origin, Development and Activities' by V. N. Patwardhan," 1950, p. 19, Folder 381, Box 44, Series 464A, RG 1.2, Projects, RF, RAC.
[358] "Travel Grant for Dr. V. N. Patwardhan," 1958, Folder 545, Box 58, Series 464D, RG 1.2, Projects, RF, RAC.
[359] Ibid.

elaborate and time consuming methods than a careful clinical appraisal."[360] Patwardhan further remarked that the material problems facing India required a focus upon the treatment and prevention of manifest deficiency diseases and not the identification of latent ones. Considering that reality, he argued that the limited medical resources of India's public institutions should not be syphoned into expensive surveys that relied upon biochemical tests and extended laboratory confirmations of obvious facts.[361] Patwardhan noted his great respect for new innovations in laboratory-based work on dark adaptation, also known as night vision, and vitamin A status and saturation and dermal tests for vitamin C nutrition. Nevertheless, he concluded that the severity of malnutrition across the subcontinent and India's limited scientific resources demanded that public health officials remain dedicated to an observation-driven clinical approach.

At the same time, the expensive, biochemical analysis-driven studies that Patwardhan initially discouraged proved extremely powerful in identifying nutritional diseases among specific at-risk groups. For instance, between January 1951 and June 1952, Muktha Sen, professor in the Department of Maternity and Child Welfare at the All-India Institute of Hygiene and Public Health, conducted a series of hemoglobin surveys of nearly 1,400 pregnant patients at the Singur Health Centre. Confirming her findings through a similar study in Calcutta, she found that anemia and toxemia accounted for roughly half of all maternal mortality. As she wrote in reference to the population of Singur Health Unit:

> Anaemia in pregnancy is a very common occurrence, the average haemoglobin content of the blood of expectant mothers being about 8.3 g per 100 cc. Among the principal cause of maternal deaths, anaemia also has been all along a most important cause. Sometimes, it contributes more than 40% towards the total deaths.[362]

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[360] Patwardhan, 172.
[361] Ibid.
[362] "'Nutritional Anaemia in India: A Preliminary Report' by A. W. Woodruff," 1955, p. 7, File no. N 3/286/5 (microfilm), Centralized Files–3rd Generation, WHO.

Sen's findings drew the attention of the Indian Council of Medical Research and contributed to her further work in collaborations between India's nutritional research scientists, the FAO, and the WHO, devoted to the problem of maternal and postnatal anemias.[363] Patwardhan and the Nutrition Research Laboratories played a key role in the resulting coordinated program of the WHO and the FAO and the WHO, offering both organizations access to over thirty years' worth of survey data compiled in Coonoor from hematological studies of iron deficiencies and parasitic infections conducted across the subcontinent.[364] Now collaborating directly with Sen at the All-India Institute, Patwardhan would build off her new blood-analysis data to design a set of therapeutic trials involving different diets consumed by research subjects at the Coonoor Nutrition Clinic.[365] Brought together in this collaboration by the FAO and WHO, Patwardhan and Sen's studies would help to clarify the extent to which cases of anemia among rural women could be reversed through iron and protein supplements. In this way, the FAO and the WHO harnessed the turn toward biochemical analysis and the merger of the clinic and the laboratory in the interests of an emerging notion of global health.

Not to be excluded from these new developments in the nutritional sciences, the Rockefeller Foundation began to express greater interest in the work of Nutrition Research Laboratories beginning in 1957.[366] That year, Richmond K. Anderson, assistant director of the Biological and Medical Division, issued a grant for Patwardhan to travel to the Nutrition Division of the FAO in Rome, as well as to tour nutritional research laboratories

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363 "'A Short Note on the Problem of Anaemia' by Dr. M. K. K. Menon," 1955, p. 1, File no. N 3/286/5 (microfilm), Centralized Files–3rd Generation, WHO.
364 "'Anaemias in Indian Women'," 1955, p. 1, File no. N 3/286/5 (microfilm), Centralized Files–3rd Generation, WHO.
365 Ibid.
366 "Travel Grant for Dr. V. N. Patwardhan," May 16, 1958, Folder 545, Box 58, Series 464D, RG 1.2, Projects, RF, RAC.

and clinics across the United States, Mexico, Jamaica, Guatemala, and Colombia.[367] Over the next few years, Rockefeller cultivated a strong working relationship with Patwardhan and his successor as director, C. Gopalan. Through 1961, Rockefeller's investments in the nutritional sciences at Coonoor remained confined to issuing travels grants to aid in the professional development and network-building of the institution, notably providing funds for collaborations with the FAO and the WHO.[368] In 1958, however, Patwardhan and the Indian Council of Medical Research organized the relocation of the Nutrition Research Laboratories to more ample accommodations at the more centrally-located campus of Osmania University in Hyderabad.[369] Noting that, "in the expansion and reorganization currently taking place at the Nutrition Research Laboratories, an acute need for additional equipment is being encountered," Rockefeller allocated $35,000 for supplies for its laboratory and clinic.[370] More specifically, Rockefeller financed a significant expansion of the Nutrition Research Laboratories' capacity to undertake "epidemiological and experimental studies" related to energy metabolism, protein malnutrition, and atherosclerosis.[371]

In funding the purchase of top-of-the-line American laboratory and medical equipment unavailable in India, Rockefeller substantially shifted the research agenda at the institution. Through the early 1960s, Rockefeller would award a number of grants, each worth tens of thousands of dollars, to finance an existing research agenda centered on malnutrition and remedying diseases of deficiencies. This new relationship would also push the nutritional research at Hyderabad in new directions. As will be shown in the next

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[367] Ibid.
[368] "Resolution on Hyderabad Nutrition Research Laboratories," June 29, 1961, Folder 381, Box 44, Series 464A, RG 1.2, Projects, Rockefeller Foundation Records, RF, RAC.
[369] Ibid.
[370] Ibid.
[371] Ibid.

chapter, Rockefeller's expanded involvement with the Nutrition Research Laboratories would also place nutritional scientists in the role of evaluating the new seeds of the coming Green Revolution.

MALNUTRITION, POVERTY, AND INTERNATIONAL HEALTH

From bases in Coonoor, Hyderabad, and Calcutta, India's nutrition experts increasingly pursued inquiries into the nutritional health of India's most vulnerable populations—including rural women and children, the poor, and agricultural laborers. Forwarded by Indian nutritional scientists at the Nutrition Research Laboratories in Hyderabad, as well as by researchers at the All-India Institute of Hygiene and Public Health in Calcutta, these inquiries demonstrated a firm basis in the research agenda set out by the earlier efforts of Robert McCarrison, W. R. Aykroyd, and V. N. Patwardhan. This influence also pushed the nutritional sciences to engage increasingly with agronomists, economic botanists, and other agricultural scientists through the 1950s and 1960s as India pursued an ambitious agenda to increase grain production exponentially. As David Arnold observes, "McCarrison's success in relating nutritional issues to the basic health of the people and to the needs of agricultural productivity established the importance of nutritional research in in India for decades to come."[372] McCarrison's successors at the Nutrition Research Laboratories would sharpen this focus upon the health of vulnerable populations and clarify the relationship between the nutritional and agricultural sciences. As Vernon rightly notes in the context of hunger in Britain:

> The most forceful advocates of the new definitions and standards were social nutritionists, who, set out to transform political, social, and economic life. Their discovery of malnutrition transformed the social problem of the hungry into a much larger nutritional problem for society: that is to say, hunger was no longer

[372] Arnold, "The 'Discovery' of Malnutrition and Diet in Colonial India,"19.

> seen as the particular preserve of the poor, for all society now shared the problem of maintaining and improving nutritional health.[373]

Much the same could be said of the effect of the advocacy work of nutritional scientists in India in the postwar era. At the same time, within the context of the rising paradigms of international development, hunger did endure as an object of scientific study very much associated with poverty. Inheriting much from older notions of humanitarian relief and charitable donation and informed by the nutritional sciences, development institutions launched efforts to battle hunger that, in their rhetoric, seemed almost intrinsic to the 'developing' world.

Through the 1950s and 1960s, the calls of nutritional scientists for the state to actively guarantee the access of the rural poor to nutritious foods frequently went unheeded. As Renuka Ray observed, the call for a simple but highly nutritious mid-day meal for India's rural schoolchildren had sat on the agenda of the All-India Women's Conference since the early 1930s. She lamented, however, that public health officials and politicians failed to enact such a program on a nationwide basis following independence in 1947.[374] Writing in 1951, V. N. Patwardhan echoed these concerns, expressing fears that public health officials had not moved quickly enough to counter long-running malnutrition at the local level. As he wrote:

> The contribution made by the State Public Health Services in the fight against malnutrition has been extremely meagre, so meagre in fact that no remarkable achievement can be cited on the credit side of the ledger. This is indeed astonishing in view of the fact that laboratory researches and investigations in the field have demonstrated the crying need for some action. [375]

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[373] Vernon, 158.
[374] "Draft of 'Health and Nutrition of the School Child in India' by Renuka Ray," October 24, 1961, p. 1, Speeches and Writings by Renuka Ray. Folder 50, Renuka Ray Papers, NMML.
[375] Patwardhan, 312.

A major problem in mobilizing "some action," Patwardhan continued, emerged in the limited number of organizations dedicated to problems of malnutrition among India's rural poor. Prior to the Second World War, he noted, only three provincial governments funded nutrition organizations of any kind.[376] Following independence and after the establishment of the Republic of India in January 1950, that number shot up to nine, but Patwardhan noted that most of these small new organizations could not run laboratories of their own. In this way, Patwardhan argued, rural India remained largely excluded from the benefits of laboratory and clinic-based nutritional science. This lack of evenly-divided resources worked to obscure the nutritional ramifications of poverty in states like Bihar, Orissa, and Assam, forcing scientists and government officials to rely upon older data sets and reports, like those compiled by W. R. Aykroyd through the 1930s and 1940s.[377]

Aykroyd himself had frequently called for greater care to be given to the connection between malnutrition and poverty. For instance, citing surveys in rural Bihar and Hyderabad conducted in the early 1940s, he wrote in 1944 that, "special attention must be drawn to the improvement in diet which is associated with increase of income."[378] Far beyond simply eating more food, nutrition surveys found that families and individuals who had seen improvements in their economic condition were eating different kinds of food. In championing further research into the connections between malnutrition and underlying poverty, Aykroyd's influential role as the director of the Nutrition Division of the FAO after 1945 set him in a prime position to bring the work of the Nutrition Research Laboratories at Hyderabad to the attention of the global scientific community. At the FAO in Rome, Aykroyd also worked to ensure that the practical, laboratory-based research

[376] Ibid., 315.
[377] Ibid.
[378] Aykroyd, *Note on Food and Nutrition Policy in India*, 4.

drawn from India would influence international nutrition policies. Toward that goal, he attempted to ensure that India won its share of the FAO's limited resources, arguing, as the scientific directors of the Rockefeller Foundation had in 1944, that the subcontinent offered an ideal context in which to explore new nutritional theories.

One of the FAO's early nutrition programs in independent India took the form of an attempt at employing the Singur Health Unit as a platform for training nutritional surveyors from across Asia in the methods that the All-India Institute had crafted and perfected there through the 1940s. In Calcutta in September 1951, the All-India Institute of Hygiene and Public Health launched a fifteen-week-long training course in nutrition, directed by Lt. Col. C. K. Lakshmanan, director of the institute. Originally proposed at a conference of the WHO Regional Committee for South-East Asia in Colombo the previous year, Aykroyd's Nutrition Division of the FAO and the WHO sponsored the training course with the specific aim of educating public health workers and program administrators across South and Southeast Asia in the "principles of nutrition."[379] The training course emphasized skills in the design of nutritional surveys and the best practices of data collection that could then be disseminated once trainees returned to their home countries.

R. C. Burgess and K. Rajagopal, the FAO scientists who coordinated the training course, reported that the All-India Institute took the trainees directly into the field, giving them firsthand insights into the living conditions and research methodologies at play in the Singur Health Unit. Following an extensive program of lectures in food sanitation, clinical nutrition, dietetics and family budget planning, the trainees spent ten days in Singur, honing their skills in conducting nutrition fieldwork. In Singur, they also paid visits to industrial

[379] "Report on the International Course in Nutrition, Southeast Region," December 1951, Technical Assistance Program – Nutrition Projects, Folder P-201, Series J-24, RG 12, NUT, FAO.

canteens, office canteens, milk distribution centers, and schools to observe the administration of midday feeding programs. As they remarked:

> The field survey was an extremely valuable part of this course. The students were all drawn from rice growing countries and knew something of the way of life and problems of their own peasants. The differences they saw in the Singur households stimulated much discussion and established contacts between students from different countries.[380]

In their final reports on the experience of conducting fieldwork in the Singur Health Unit, many of the trainees expressed a hesitation about engaging the rural population under study. As Burgess and Rajagopal noted, some trainees had expected the Indian staff of the Singur Field Centre to accompany them on their visits to local families, whether to facilitate conversation or simply to translate their nutritional health questions into Bengali. Nevertheless, Burgess and Rajagopal dismissed these concerns, concluding: "Our view is that under ordinary circumstances nutrition surveys are beset with difficulties and that the student should at least surmount some of them himself."[381] In the name of global health, this trial by fire approach thus sent unprepared nutritionists from Thailand, Indonesia, Burma, and across India scrambling to interrogate puzzled families in Singur about their dietary habits.

That said, residents of the Singur Health Unit could expect such intimate queries from foreigners and Indian physicians alike. As will be shown in the next chapter, Singur served as the experimental area for the Population Council's long-running study in family planning education beginning in 1957.[382] Coordinated by the All-India Institute's new director, Muktha Sen, and statistician K. K. Mathen, the study sought to lower birth rates in the experimental area by employing a wide-range of instructional tools to educate both

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[380] Ibid., 7.
[381] "Report on the International Course in Nutrition, Southeast Region," December 1951, Technical Assistance Program – Nutrition Projects, Folder P-201, Series J-24, RG 12, NUT, FAO.
[382] Population "India: The Singur Study," 2.

women and men in contraceptive techniques and family planning methods. Through such interventions, the residents of Singur and surrounding townships would see a shift in the All-India Institute's research priorities for the Health Unit through the 1950s. In this way, the initial Rockefeller-financed nutritional survey of the area would blossom into an influential population management initiative by the early 1960s. In the meantime, however, the quest to prevent malnutrition and diseases of deficiency competed with the philanthropic imperatives to increase food grain outputs exponentially and to restrict population growth significantly. Improvements within the nutritional sciences also inspired concerns regarding India's growing population and how demographic changes might contribute to widespread hunger and malnutrition.

By the end of the 1950s, the debate over the connection between hunger and population growth had begun to reference the earlier work of nutritional scientists in advancing calls for growing substantially more food grains and restricting population growth. One early example of this avenue of argumentation came from S. K. Kelavkar, the former judicial minister of Kolhapur State, who published a treatise in 1946 with the succinct title, *Our Food Problem*. In it, Kelavkar lamented India's high population growth rates. Turning to an analysis of the food supply, he argued "the problem has always been treated as one of poverty and never been considered to be one of shortage," and subsequently made the case for greatly extending India's production of food grains.[383] In his work, Kelavkar applauded McCarrison and Aykroyd's work in Coonoor and made reference to the caloric requirement estimates for healthy Indian adult males (2,600 calories per day) in determining that India faced an urgent shortage of foods.[384] He further called for immediate large-scale investments by the Government of India in increasing

[383] S. K. Kelavkar, *Our Food Problem* (Kolhapur: Arya Bhanu Press, 1946), 3.
[384] Ibid., 15.

agricultural production, concluding, "Just as in a war one does not reckon the expense when the enemy must be beaten at all costs, here also we have to beat an enemy who if we do not beat him, will beat us and destroy us."[385] Kelavkar's impassioned call for immediate action, without regard to cost, aptly captured the sentiments that would drive the agricultural sciences forward in India through the 1950s and 1960s. In particularly, such concerns, grounded in earlier scientific explorations of the nature of malnutrition in South Asia, bolstered increasingly vocal calls for harnessing the agricultural sciences to generate exponentially larger food grain harvests.

Fifteen years later, this tension became apparent at the National Institutes of Sciences of India's Symposium on Food Needs and Resources held at Mysore in May 1961. A gathering of India's top nutritional and agricultural scientists, the meeting's convener, the wheat geneticist Benjamin Peary Pal, hoped that the gathering would facilitate coordination between the various fields of food science upon the inauguration of the Third Five-Year Plan.[386] At the symposium, the complex relationship between the wider objectives of nutritional and agricultural sciences became apparent. For instance, demographer C. Chandrasekaran cautioned that improvements in the nutritional health of India's population might inadvertently prompt an increase in population growth rates. As he wrote:

> The relatively low level of Indian fertility as compared with many pre-industrial population and a study of some of the biological factors connected with Indian fertility make it plausible that better nutrition may operate towards increasing the birth rate. While the existence of this factor does not necessarily imply there will

[385] Ibid., 63.

[386] B. P. Pal, *Proceedings of the Symposium on Food Needs and Resources* (New Delhi: National Institute of Sciences of India, 1962), v.

> be a definite rise in the birth rate […] food planners should play safe and be prepared for larger increases in India's population in the near future…[387]

Representing the nutritional sciences at the Mysore Symposium, nutritionists V. Subrahmanyan, A. Sreenivasan, and M. Swaminathan of the recently-established Central Food Technology Research Institute also argued that India's population growth rates demanded prompt action in expanding the nation's food supply.[388] That said, they also stressed that increases in the food grain supply alone would fail to reverse "nutritional deficiency states" if not coupled with wider supplies of protective foods like milk, eggs, pulses, oilseeds, green leaves, and other vitamins and minerals. They observed that woefully inadequate supplies of nutritious food had left broad swaths of the population susceptible to deficiencies, noting, "the penalty is heaviest in infants, mothers and young children."[389] Further, Subrahmanyan, Sreenivasan, and Swaminathan remarked that, since earlier surveys of malnutrition in India had consistently demonstrated protein deficiencies among India's at-risk populations, particularly children, the Government of India should pursue increases in the production of protein-rich foods.[390] In this way, the effective application of the findings derived from efforts in the nutritional sciences relied chiefly upon the willingness of public health officials and politicians to support active public education and welfare policies

For his part, W. R. Aykroyd remained concerned that the arguments made by nutritional scientist for improving the nutritional quality and diversity of the diets of India's rural poor and most vulnerable populations had been obscured by the oversized rhetoric of the double-crisis of overpopulation and food shortage. In his correspondence with

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[387] C. Chandrasekaran, "Population Trends in India," in *Proceedings of the Symposium on Food Needs and Resources* (New Delhi: National Institue of Sciences of India, 1961), 4.
[388] V. Subrahmanyan; A. Sreenivasan; M. Swaminathan, "Food Needs in Relation to Nutritional Requirements," ibid. (National Institute of Sciences of India), 5.
[389] Ibid., 6.
[390] Ibid., 11.

Canadian economic botanist L. E. Kirk, Aykroyd proved especially frank in offering his assessments of contemporary nutritional health challenges and the capacity of the FAO to address them. As he wrote to Kirk in September 1959:

> FAO has never made a statement to the effect that half the world is hungry or undernourished. It is true that, especially in the earlier days of FAO, some rather sweeping statements were made in FAO publications on undernutrition and malnutrition, but within recent years' statements on this subject have been made with due caution and in general terms, and percentage estimates have been avoided.[391]

In this light, as they faced difficult battles in convincing local governments to implement the simple and relatively inexpensive measures that would diversify diets and improve the nutritional outcomes of the world's poor, nutritional scientists had framed malnutrition as a global crisis that could only be solved through massive interventions. Now, with agricultural science-driven efforts to vastly increase global grain production proceeding at full-speed into the 1960s, the nutritional sciences would struggle to find an effective place in advocating for the kinds of public health interventions that could immediately and effectively ameliorate the problems of malnutrition facing South Asia.

CONCLUSION

Writing in 1982, Renuka Ray expressed dismay at the deficiency diseases still widely endured by rural India's schoolchildren. Two decades after she had served as chair of the School Health Committee, the vision forwarded by India's most influential nutritional sciences for dramatically improving the health of children across the nation remained largely unrealized. Over a decade before the centrally-sponsored Midday Meal Scheme would be launched in 1995 and the right to food would be recognized by India's Supreme Court in 2001, the nation continued to grapple with some of the highest levels of

[391] W. R. Aykroyd to L. E. Kirk, September 24, 1959, Dietary Requirements, Series NU – 8/1, RG 57.1, NUT, FAO.

childhood malnutrition in the world.[392] Lamenting the intransigence of the Government of India in fully implementing the measures proposed by the committee, Ray wrote:

> Today we find that the recommendations of the School Health Committee which had been accepted as far back as 1965 […] are not yet implemented on a countrywide scale. In some States, such as Gujarat, a beginning has been made but in others, such as West Bengal, the work still lags behind, and in some States it has hardly been introduced.[393]

In this way, the expansive new knowledge generated by the efforts of nutritional scientists and dietitians in the decades following Partition remained constrained by the limitations of public policy. Though successive governments had devoted vast resources toward the pursuit of the agricultural production increases of the Green Revolution of the late 1960s and 1970s, the simple improvements in food provision and access championed by Ray remained elusive. These lingering failures could be traced back to the disconnect between preventive techniques promoted by nutritionists and the curative promise implied by the sweeping innovations promised by the agricultural sciences. In some sense, hunger could not simply be prevented. The innovation-driven nature of the agricultural sciences demanded that it needed to be cured.

Through the 1950s and 1960s, while agricultural scientists and development planners sought to launch large-scale, capital-intensive initiatives across the subcontinent, the nutritional sciences engaged South Asia's food situation in intimate ways. In these efforts, dietitians, physicians, and surveyors worked along local lines, seeking preventive solutions tailored to specific communities. Their resulting diet and nutrition surveys drew socioeconomic, physiological, and biochemical data from India's most vulnerable populations. Laboratory scientists pursued investigations into the nutritional content of

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[392] Jean Drèze; Aparajita Goyal, "Future of Mid-Day Meals," *Economic and Political Weekly* 38, no. 44 (2003): 4673.
[393] Ray, 235.

common Indian foods, producing compendiums that suggested the "proper" ways of preparing and eating meals to enable adequate self-care. International organizations like the FAO and the WHO worked to facilitate an exchange of new nutritional research and population data between India and the broader world. All the while, these interventions featured a constant negotiation between the intimate realm of individual care on the one hand and the wider, abstracted realm of public health surveillance on the other. The ever-present tension between these two relations transformed patients into unwitting research subjects, inserting the laboratory into the clinic and unfolding the clinic into the field. At the same time, these forces also led nutritionists and dietitians to engage more directly with the concerns of the agricultural sciences, pursuing improvements in the nutritional quality of India's rapidly expanding food supply through the late 1960s and 1970s.

Chapter Four: Into the Fertile Future

On January 2, 1952, Warren Weaver and John D. Rockefeller III met for dinner at the Century Club in Midtown Manhattan. Joined by businessman Lewis L. Strauss, biophysicist Detlev Bronk, and attorney Donald H. McLean, Jr., they discussed a problem that had recently begun to plague the mind of the forty-five-year-old Rockefeller. Heir to his grandfather's fortune and to his father's legacy as one of the world's leading philanthropists, Rockefeller explained that he had developed a concern for the issue of "population and resources" on a global level.[394] As they ate, the group discussed the prospect of organizing a conference of fifteen to twenty of the nation's top experts in demography, population control, and the agricultural sciences to inform Rockefeller's thinking on such topics. Already busy with preparations for an upcoming fact-finding mission to India to plot a possible Rockefeller Foundation intervention in agriculture, Weaver insisted he had little time for a new project.[395] Nevertheless, Rockefeller would summon him frequently through 1952, distilling Rockefeller's vague concerns into clear plans for a new philanthropic organization: The Population Council.

After consulting experts at the conference hosted by the National Academy of Sciences in Williamsburg, Virginia in late June, Rockefeller moved enthusiastically toward the idea of a new non-profit organization that would open population offices around the world. Its objective would be to gather data and raise local awareness of the threat of overpopulation.[396] The new agency would be at once socially-engaged and invested in increasing food resources, tackling population issues in the broadest sense possible.[397] Alarmed by the broad scope of this proposal, Weaver pressed his employer to confine the

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[394] Warren Weaver diary, January 2, 1952, RG 12, Officers' Diaries, FA392, RF, RAC.
[395] Ibid.
[396] Warren Weaver diary, June 22, 1952, RG 12, Officers' Diaries, FA392, RF, RAC.
[397] Weaver diary, August 21, 1952, RG 12, Officers' Diaries, FA392, RF, RAC.

organization's attention to fertility restriction as a matter of public health.[398] Rockefeller pushed back. As Weaver recorded in his Rockefeller Foundation officer's diary on September 4, 1952:

> It would be WW's own personal recommendation that JDR III undertake activity in the field of control of human fertility, on the grounds that this is obviously an exceedingly important and pressing problem, […] that no one else seems to be working actively or completely in this particular area, and finally that this is an area in which the RF itself is very unlikely to work. It is fairly clear that JDR III is not very happy about this suggestion.[399]

Through the second half of the year, Weaver observed Rockefeller at first resisting and, gradually, accepting a strict focus on the control of human fertility. As Matthew Connelly notes, Rockefeller's conclusion that the Population Council should emerge as a separate institution came in part at the behest of Frank Notestein and Frederick Osborn, the influential Princeton eugenics-embracing demographers who argued that a new institution could become "a nexus for all other major players in the field," including the International Planned Parenthood Foundation (IPPF), the Ford Foundation, and others.[400] By December, the new Population Council, endowed with an initial $100,000, stood poised to join the Rockefeller Foundation in India, exploiting the latter's institutional connections in public health and complementing the foundation's emerging investments in the agricultural sciences.[401]

This chapter tracks how Indian and American scientists working with the Rockefeller Foundation and the Population Council linked the concepts of seed and soil fertility to overarching concerns regarding overpopulation as they advanced down the road to the Green Revolution. Eugenic conceptions of fertility regulation took center stage in

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[398] Ibid.
[399] Weaver diary, September 4, 1952, RG 12, Officers' Diaries, FA392, RF, RAC.
[400] Connelly, 159.
[401] Weaver diary, December 1, 1952, RG 12, Officers' Diaries, FA392, RF, RAC.

the strategic thinking and planning efforts of the agricultural scientists of the Rockefeller Foundation and the physicians of the Population Council as they launched their operations in India during the 1950s. At the same time, rural extension work and nutritional research sank into subsidiary roles in the quest to increase South Asian grain production drastically and to restrict population growth. Inevitably, tensions emerged between these sciences, as well as between scientists and administrators tasked by governments and philanthropic organizations with addressing the apparent challenges of food shortage and overpopulation. Rockefeller's top officials and strategists, for example, approached the efforts of India's nascent community development and rural extension programs with deep skepticism, if not outright contempt. In their view, the dual crisis of food shortage and overpopulation could not be approached through tedious social restructuring or costly economic redistribution. Only rapid and momentous innovations in the agricultural sciences could reverse rural India's perceived backwardness, raise standards of living, and deliver food security to "millions enslaved by centuries of tradition."[402]

To that end, the Rockefeller Foundation reoriented its programming in India toward the goal of increasing food grain production through field and laboratory investigations into the development of high-yielding, hybrid seed varieties in 1956.[403] At the same time, the Rockefeller Foundation remained heavily invested in public health in India and, most prominently, through studies of the efficacy of contraceptive practices in Punjab and West Bengal, maintained a corresponding interest in direct population control through the 1950s. Indeed, after its establishment as a separate Rockefeller-funded agency in late 1952, the Population Council sponsored studies undertaken in India by American universities and

[402] J. G. Harrar, Paul C. Mangelsdorf, and Warren Weaver, "Notes on Indian Agriculture," April 11, 1952, p.11, Folder 4, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[403] Cullather, 181.

domestic public health institutions, most notably the All-India Institute of Hygiene and Public Health under the leadership of Indian scientists Muktha Sen and K. K. Mathen in Calcutta. The decade-old Singur Study Unit, already the site of Rockefeller-funded nutritional research, would be recast as a test site for the assessment of family planning methods and experiments on the efficacy of oral contraceptives which had recently become more readily available. In this way, the Rockefeller Foundation and the Population Council pursed intertwined agendas through the 1950s, both working closely with the Government of India and supporting its political agenda to deliver on planning promises of increased food production and steady economic growth through modernization and industrialization. Toward a future dimmed by the prospect of Malthusian catastrophe, the Rockefeller Foundation and the Population Council advanced down parallel paths, pursuing complementary goals — one to augment the fertility of India's countryside, the other to rein in the fertility of India's population.

'THE INDIAN CULTIVATOR DOES NOT FARM'

In December 1951, the scientific planning staff of the Rockefeller Foundation in New York concluded their initial discussions of a possible intervention in Indian agriculture, resolving to send a team of high-ranking investigators to assess the viability of work in the subcontinent. This team, consisting of J. George Harrar, Paul C. Mangelsdorf, and Weaver, now in his new role as the foundation's Director of Agriculture, spent four weeks in India through February 1952, meeting with Indian officials and touring farm sites and rural extension centers across the country. The three had performed a similar survey of Mexico's agricultural needs for the Rockefeller Foundation in 1939.[404]

[404] Ibid., 189.

Complementing Weaver's background in mathematics and research administration, the plant pathologist Harrar had directed Rockefeller's Mexican Agricultural Program since 1943, overseeing rapid progress in the hybridization of wheat and other food grains. Indeed, Rockefeller officials and the Mexican government viewed the program as an unprecedented success and Harrar's protégé, Norman E. Borlaug, would be awarded the Nobel Peace Prize in 1970 for his work in developing high-yielding, disease-resistant wheat varieties.[405] Under Harrar's leadership, the Mexican Agricultural Program's research model of identifying and hybridizing high-yielding grain varieties would prove central to the foundation's work in Indian agriculture.[406] Trained at Harvard, the fifty-two-year-old botanist Mangelsdorf boasted a distinguished career in maize research and had also conducted extensive fieldwork in Mexico as a member of the Rockefeller Foundation's Survey Commission in 1941. His broader work, in part, sought to identify the genetic origins of American corn varieties and to develop new varieties through hybridization.[407]

As Nick Cullather writes of the assumptions of Rockefeller officials as they approached the question of intervention in India: "Agriculture was the key to the entire development equation, the regulator of fertility, catalyst for breaking down social and familial customs, and stimulant for a general expansion of national wealth."[408] With that assumption firmly in mind, Harrar, Mangelsdorf, and Weaver's report, entitled simply "Notes on Indian Agriculture," laid out the prospects for the Rockefeller Foundation's

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[405] John J. McKelvey, *J. George Harrar: A Biographical Memoir* (Washington, D.C.: National Academy of Sciences, 1987), 33.
[406] "J. George Harrar Biographical Data" Folder 330, Box 8, FA 485, Biographical Files, RF, RAC. Harrar would hold executive roles in the Division of Natural Sciences and Agriculture until his appointment as president of the foundation in 1961.
[407] Waterhouse, 98.
[408] Cullather, 188.

agricultural programming in India. While emphasizing the scientific and technical dimensions of an effort to improve Indian food production capacity, the report began with an acknowledgement of the social and economic issues then being addressed by the work of community development and rural extension advocates in north India like Albert Mayer, S. K. Dey, and Arthur T. Mosher, whose work was examined in Chapter Two. As the Rockefeller team wrote:

> The most serious problem faced by agriculture in India is not a technical one, but a cultural one. The greatest handicaps which agricultural development must overcome are those imposed by the caste system, by ignorance, by religious prejudices, by multiplicity of languages, by the many stifling customs, and by habits of thought which prize tradition over improvement.[409]

With that acknowledgment of the challenges facing post-Partition India, Harrar, Mangelsdorf, and Weaver assessed and critiqued existing efforts at jump-starting Indian food production and laid out a case for Rockefeller to invest conservatively and selectively in strengthening the new nation's scientific capacity. The report resounds with a mix of fatalism, hopelessness, and notes of optimism drawn from the prospect that the wide cultivation of improved grain varieties, like those already developed by Rockefeller scientists in Mexico, might generate the boost in food grain production needed to avoid a famine.

In their report, Harrar, Mangelsdorf, and Weaver proved wary of the rural extension and community development initiatives supported by the Ford Foundation and supported by Point Four through the U.S. Technical Cooperation Administration (TCA). They noted that the Ford Foundation had awarded Allahabad Agricultural Institute two grants during the previous year, amounting to $500,000 and $440,000 for the construction of facilities and the expansion of the nascent rural extension program, respectively.[410] Under the

[409] Harrar, Mangelsdorf, and Weaver, 12.
[410] Ibid., 23.

direction of Arthur Mosher, Sam Higginbottom's old missionary project had emerged as an important national center for agricultural education, as shown in Chapters One and Two. The Rockefeller team applauded the Allahabad Agricultural Institute's development as an independent center for rural extension and agricultural education under Mosher, recommending that future foundation support keep pace with the Ford Foundation's recent investments.

Albert Mayer's Etawah pilot project, on the other hand, involving 97 villages and costing roughly $48,000 a year, could simply not be replicated to address cost-effectively the joint problems of overpopulation and food shortage.[411] The Rockefeller team considered Mayer's initiative too expensive and unwieldy to provide a realistic blueprint for a potential intervention in agriculture. That said, Harrar, Mangelsdorf, and Weaver acknowledged that the community development work at Etawah had correctly emphasized improved farming methods and the cultivation of high-yielding wheat varieties. Like the Allahabad Agricultural Institute, Etawah operated from the lauded assumption that agricultural improvement needed "to occur on a broad social front and at a simple level, and that there has to be a departure from old ways and customs."[412] By their own estimates, food production in the Etawah district rose some fifteen to thirty per cent over the course of Mayer's initiatives to farm hybrid wheat varieties in conjunction with the Indian Agricultural Research Institute (IARI) and the Ford Foundation.

The "inspiring show" at Etawah, however, with its technical limitations and tolerance for unscientific practices, could not be replicated on a national, much less a global scale.[413] Regarding the Ford Foundation's "frightening" proposals to replicate Etawah

[411] Ibid., 19.
[412] Ibid., 26.
[413] Ibid., 20.

across India, Weaver simply advised, "The RF should stay away from this particular plan, and pray."[414] Moreover, Harrar, Mangelsdorf, and Weaver speculated that the Etawah model of community development would not fare well in the face of inadequate staffing, restricted water resources, and the low-yielding rice and sorghum varieties typically cultivated by farmers across the subcontinent.[415] Following Weaver's advice, the foundation would not finance any such nationwide programs in village-level intervention. The Rockefeller team subsequently turned to address the evolving relationship between the TCA and the Government of India's nascent community development initiative evolving from the model of S. K. Dey's project at Nilokheri. Harrar, Mangelsdorf, and Weaver observed that the TCA's investments sought to address two major areas of concern in rural India. First, the program would support the launch of development centers to coordinate projects in villages across India. Second, with an initial investment of $18 million, the TCA would irrigate large swaths of north Indian farmland through the installation of tube wells, Persian wheels, and electric pumps.[416] Here again, Rockefeller's fact-finding mission declined to endorse an approach that involved vast infrastructural investments and that relied upon the recruitment of thousands of village-level workers to serve as foot soldiers in the community development crusade.

With TCA officials confidentially relaying that their joint Indo-American venture would expand to 320 project areas by 1955, the Rockefeller team estimated the community development initiative's needs at roughly 9,000 college-trained supervisors and specialists — 1,500 of whom would need to be recruited from the United States and the rest drawn

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[414] "Notes on Discussion: India Conference (including Pakistan and Ceylon)," March 26, 1952, p. 12, Folder 4, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[415] Harrar, Mangelsdorf, and Weaver, p. 20.
[416] Ibid.

from India's own universities.[417] For Harrar, Mangelsdorf, and Weaver, the numbers appeared staggering, rendering the TCA's approach to rural development woefully impractical. The Rockefeller team was especially skeptical of the officials at the helm of this expanding community development movement, still in its heyday. As they observed: "Some of them [India's community development administrators] are essentially small persons who have been lifted up into positions of tremendous responsibility for which they are unequipped, intellectually or in any other way."[418] Indeed, as S. K. Dey, the director of India's community development program, had boasted on numerous occasions, enthusiastic amateurs and not farming experts led India's rural movement.[419]

The Rockefeller team interpreted this type of engagement as a profound liability that not only foreshadowed poor returns on the foundation's potential investment, but that could also delay India in its quest to increase food production. Beyond its core staffing requirements, Harrar, Mangelsdorf, and Weaver further estimated that India's community development push would need to recruit between 18,000 and 40,000 village level workers to fan out across an estimated 600 project sites to serve a rural population of about 120 million, or roughly one-third the population of India. These daunting figures aside, they remained most troubled by the outlook and approach of those already involved in Indian community development at the highest levels. As they wrote:

> [T]he situation is characterized by a frightening mixture of almost fanatic devotion, optimism based on the supposed accuracy of technical information which has in many instances passed through incompetent hands, and an administrative confusion which would be found congenial only by the Mad Hatter.[420]

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[417] Ibid.
[418] Ibid., 22.
[419] Dey, 88.
[420] Harrar, Mangelsdorf, and Weaver, p. 22.

Indeed, as shown in Chapter Two, India's community development initiative would buckle under the weight of its internal bureaucracy and its failure, in the eyes of government investigators, to meet the needs of the rural populations it served. Casting aside the prospect of reshaping India at the village level, Harrar, Mangelsdorf, and Weaver instead viewed India's agricultural problems as a strict function of inadequate resources for a ceaselessly growing population. As they wrote: "Not only is there too little land, but the land has too little water, too little fertility, and is divided into far too many small holdings. The Indian cultivator does not farm — he gardens — and he does so under innumerable handicaps."[421] Harrar himself would later indicate that the foundation's explicit emphasis on food production increases over a concerted initiative in population control frustrated him through the 1950s. As he noted of Rockefeller's eventual turn toward a direct engagement of population issues in the 1960s: "After what I thought was a too long delay, the foundation decided to participate more actively in the problems of population stabilization."[422] In the meantime, however, the Rockefeller fact-finding mission to India concluded that human fertility simply outpaced the prolific capacity of local seeds, the natural fertility of the soil, and the productivity of the nation's ill-equipped and poorly-educated farmers.

This bleak picture of backward farming, exhausted soil, and a rapidly reproducing peasantry seemed to confirm foundation officials' initial assumption that South Asia faced a population crisis. In some sense, the fact-finding mission's analysis took these conditions to be the natural features of the Indian subcontinent — a place burdened by these forces since time immemorial. Such an assessment did little, if anything, to investigate any

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[421] Ibid., 11.

[422] J. George Harrar, "Transcript of Taped Interviews with Dr. J. George Harrar," 1979, p. 6, Folder 1, RG 12, Oral History Interviews, RF, RAC.

connections between hunger and poverty, much less poverty and colonialism. Instead, the Rockefeller Foundation's first agricultural fact-finding mission interpreted the challenges facing Indian agriculture firmly in the context of overpopulation coupled with the infertility of the nation's farmland. Beyond advocating for improvements in graduate-level education in agriculture and centralized training in rural extension, the team advised against costly and tedious projects to remake rural Indian society. Instead, they recommended that the Rockefeller Foundation move ahead with a program focused on financing promising scientific research into raising grain yields and improving soil fertility.[423] Over the next four years, the foundation would do precisely that. In the meantime, the Population Council independently began to attend to the other side of the overpopulation-food shortage equation.

SITUATING POPULATION CONTROL WITHIN PUBLIC HEALTH

There was, of course, a connection between nutrition and population regulation in the minds of demographers in the 1940s and 1950s. Articulated and promoted stridently by Frank Notestein, the demographer at the Office of Population Research at Princeton University and who would later lead the Population Council, demographic transition theory proposed that birth rates would decrease as industrialization took place.[424] As Cullather writes: "Transition theory suggested a strategy. Higher levels of consumption, particularly of food, would trigger a drop in the birthrate. Advances in agriculture would also improve health, incomes, and productivity."[425] At the same time, however, with Rockefeller Foundation's top agricultural scientists speculating that dramatic increases in food

[423] Harrar, Mangelsdorf, and Weaver, p. 11.
[424] Sarah Hodges, "Governmentality, Population and Reproductive Family in Modern India," *Economic and Political Weekly* 39, no. 11 (2004): 1161.
[425] Cullather, 188.

production in South Asia could take decades to achieve, a dual strategy of population restriction and production increase unfolded into the early 1960s.

Field research on monitoring and, more importantly, influencing the family planning strategies of villages and farmers across the Indian countryside played a critical role on one side of this effort. Through this period, the United States was also engaged in its own domestic discussion surrounding the potentials and perils of birth control efforts. As Matthew Connelly shows, this debate was also reflected in its foreign policy, as the United States government remained officially opposed to advocating for global population control efforts from the launch of Point Four, well into the Kennedy Administration.[426] While the U. S. Agency for International Development (USAID did not "risk venturing into such treacherous terrain" through the early 1960s, President John F. Kennedy himself suggested that the UN and American philanthropic organizations address the issue at an international level without involving the American government directly.[427] In a similar way, British officials hesitated to embrace family planning efforts both internationally and within Britain's remaining colonies as they "worried about invoking the wrath of religious leaders (particularly the Roman Catholics)" both at home and abroad.[428] Colonial aid for family planning efforts in the Caribbean were also inhibited by concerns over race politics well into the 1950s.[429] Direct U.S. foreign aid for broadly-defined family planning initiatives and population research would commence under Kennedy in April 1963, accelerating gradually during the Johnson Administration.[430] As Connelly shows, this aid-driven age of global population control efforts on the part of the United States would prove

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[426] Connelly, 197-198.
[427] Ibid., 98.
[428] Nicole C. Bourbonnais, *Birth Control in the Decolonizing Caribbean: Reproductive Politics and Practice on Four Islands, 1930-1970* (New York: Cambridge University Press, 2016), 91.
[429] Ibid., 91-92.
[430] Connelly, 199.

short — interrupted with the so-called Mexico City Policy of 1984, which banned U.S. federal funding for organizations providing or promoting abortions.[431]

Rockefeller's concerns regarding India's population growth did not abate when the 1952 fact-finding mission recommended a turn toward the agricultural sciences in South Asia. Warren Weaver's long-standing optimism that scientific intervention could lead independent India to self-sufficiency in food production masked a persistent institutional interest in a population control agenda. While Rockefeller's top scientists prepared for a major intervention in the agricultural sciences in India through 1953 and 1954, the Population Council entered India to exploit the foundation's existing assets and networks in medicine and public health. In this way, two Rockefeller agencies forwarded two parallel programs in India through the 1950s, each addressing both fronts of the perceived "double crisis" of overpopulation and food shortage, articulated by Aldous Huxley in his 1949 paper published by UNESCO, then under the direction of his brother Julian.[432]

In addition to Harrar, Mangelsdorf, and Weaver's critical appraisal of Indian agriculture, Marshall C. Balfour, a physician and one of the Rockefeller Foundation's top malaria control experts, also reported on India's demographic situation during the Scientific Division's meetings on South Asia in spring 1952.[433] Balfour painted a bleak picture, emphasizing that, while only half the geographical size of the United States, India's population stood at three times that of its American counterpart. He pegged India's growth rate at roughly thirteen per cent over the previous decade and touted the reliability of the decadal census scheme initiated by the British in 1871.[434] Regarding population control

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[431] Ibid., 16.
[432] R. S. Deese, "The New Ecology of Power," in McNeill and Unger, 292.
[433] "Notes on Discussion: India Conference (including Pakistan and Ceylon)," March 26, 1952, p. 7, Folder 4, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[434] Ibid.

programming in India, Balfour described meeting with Indian Health Minister Rajkumari Amrit Kaur, a devoted Gandhian, in 1949. Of the meeting, Balfour reported, "We discussed population, and I felt that she comprehended the problems. But Gandhi believed only in continence. In no country that I know of has continence ever been popular!"[435] In his view, a more practical route needed to be taken.

Balfour went on to indicate that a committee of demographers, including two former Rockefeller fellows, had recommended that India's Planning Commission establish a dedicated agency to monitor population growth. Fortunately, he noted, the Commission was considering the proposal seriously. Further, he mentioned that the WHO and the Government of India had just begun a study that year to investigate population control efforts in Mysore. Beginning in 1952 and the first of its kind in India, the WHO-funded study in Mysore involved an investigation of the use of the rhythm method of contraception in the village of Ramanagaram.[436] The investigation's later, comparative stages would involve a second urban site in Lodi Colony in New Delhi.[437] Balfour speculated that opportunities for further studies might emerge from this work.[438] Indeed, new research opportunities for Balfour and his public health team would soon spring from the Mysore study, albeit without the involvement of the Rockefeller Foundation.

Launched in November 1952, the Population Council entered India as a grant-making agency just eight months after Balfour's presentation and a full four years before the main foundation would launch its Indian Agricultural Program (IAP) in 1956.[439] The organization found an almost immediate opening for its programming in India when, on

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[435] Ibid.
[436] Moye W. Freymann, "Population Control in India," *Marriage and Family Living* 25, no. 1 (1963): 58.
[437] John B. Wyon and John E. Gordon, *The Khanna Study: Population Problems in the Rural Punjab* (Cambridge: Harvard University Press, 1971), 275.
[438] Ibid.
[439] Connelly, 169.

December 7, 1952, Prime Minister Jawaharlal Nehru presented the Lok Sabha with plans to launch "the world's first explicit policy of population limitation" as an addition to India's First Five-Year Plan.[440] Considered by officials of the Ford Foundation as a comparatively cautious investment for its national scope, the Government of India allocated the equivalent of $1.3 million toward research-focused programming across the subcontinent.[441] Perhaps more significantly, India's emerging population control initiative inspired an enthusiastic John D. Rockefeller III to make a matching $1.3 million donation to the new Population Council's field research initiatives in India.[442]

Selected as the Population Council's associate director and first liaison in India, Balfour arrived back in New Delhi in 1953 to draw up plans for the organization's programming in the country. During one of the first field visits of his tenure, the fifty-eight-year-old physician met with maternity and child welfare researchers at the All-India Institute of Hygiene and Public Health (AIIH&PH) in Calcutta in October 1954.[443] Interested in forging institutional collaborations within India, Balfour evaluated the research capacity of the Institute to determine whether the Population Council might enlist it to investigate family planning methods in rural India. As shown in Chapter Two, the AIIH&PH had already received funding from the Rockefeller Foundation for its research in nutrition and other public health programming. The Institute also managed an extensive field study site, the Singur Health Unit, in the villages of the Singur District, just 40 kilometers north of Calcutta.

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[440] Ibid., 168.
[441] Freymann, 57.
[442] Connelly, 169.
[443] "Review of the work on Rural Field Study of Population Control at Singur up to September 1957," October 1957, p. 1, Folder 125, Box 10, IV3B4.2, Organization Files, Population Council Archives (PC), RAC.

Initially, Balfour proposed that the AIIH&PH coordinate a new field study on contraceptive use in rural Mysore, where the joint study run by the WHO and the Government of India was already underway. However, K. S. Viswanathan, an AIIH&PH administrator and professor of public health, balked at the prospect of fielding a study so far afield from the Institute's home base in West Bengal. Viswanathan consulted with the AIIH&PH's section of Maternity and Child Welfare and proposed that the requested study be conducted within the existing Singur Health Unit instead.[444] The Population Council in New York approved the AIIH&PH's "request" to collaborate on a study of family planning education on February 22, 1956 and the project began to take shape in April of that year. For its part, the Government of India contributed an annual Rs. 7,500, while the Population Council pledged the larger sum of $48,000 for three years.[445]

While the Singur Study marked one of the earliest investigations into family planning launched by the Population Council, the AIIH&PH already had an important connection to the population control movement in India. As Rahul Nair has shown, John Megaw, who founded the AIIH&PH in the 1920s, went on to define India's "population problem" as a major crisis within public health following his rise to the directorship of the Indian Medical Service (IMS) in 1930.[446] Indeed, India itself had a long history of state-sponsored family planning, particularly through the late colonial era, as Sarah Hodges, David Arnold, Anshu Malhotra, and others have shown.[447] In 1925, for instance, R. D. Karve opened India's first birth control clinic in Bombay and the Government of Mysore launched a similar clinic in 1930 that Moye W. Freymann of the Ford Foundation later

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[444] Ibid.
[445] Ibid.
[446] Rahul Nair, "The Construction of a 'Population Problem' in Colonial India, 1919-1947," *The Journal of Imperial and Commonwealth History* 39, no. 2 (2011): 233.
[447] See, for example, their essays in Sarah Hodges, ed. *Reproductive Health in India: History, Politics, Controversies* (New Delhi: Orient Longman, 2006)

speculated was the world's first state-run birth control clinic.[448] During that decade, the movement reached something of a heyday in India, with the idea of family limitation through abstinence receiving the support of Gandhi, Margaret Sanger touring the country, and the All-India Women's Conference proposing the teaching of birth control methods.[449] As Sarah Hodges and others have shown, the eugenics movement also had a long history in India, with eugenics associations emerging rapidly across the subcontinent through the 1920s and 1930s.[450] Citing enthusiastic advocates such as N. S. Phadke, Hodges shows that eugenic thinking appealed particularly well to the concerns of "the ruling classes" of India. More specifically, such ideas offered the prospect of recapturing India's "glorious eugenic past" through promises of productive marriages, racial purity, and national vitality through family planning measures.[451] In this way, eugenic thought helped to stoke interest in population control and fertility regulation across the subcontinent

Elsewhere in Asia, eugenic discussions during the 1920s and 1930s reappeared after the Second World War, repackaged within investigations of fertility regulation and birth control practices. An innovative field study of family planning launched in 1950 by Yoshio Koya in Japan, for instance, served as the chief model for population fieldwork in rural India after independence in 1947.[452] Koya's work drew comparisons between practices across three villages — one rice-growing, another in a mountainous region, and a final in a fishing village. The study came in the wake of Japan's Eugenic Protection Law of 1948 and the Japanese Diet's rejection of the removal of all restrictions on family planning, which had the effect of increasing the frequency of induced abortions while

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[448] Freymann, 57.
[449] Ibid.
[450] Sarah Hodges, "Indian Eugenics in an Age of Reform," in Hodges, 115.
[451] Ibid., 122-123; 133.
[452] Wyon and Gordon, 275.

discouraging the use of contraceptives.[453] Koya's study involved instructing villagers in the use of contraceptives. Over its six-year run, test areas observed a fifty percent reduction in abortion rates when compared with the control.[454]

Drawing upon Koya's comparative methodology, C. P. Blacker worked with the World Health Organization (WHO) and the Government of India to launch the first Indian field study of family planning in rural Mysore at Ramanagaram and Lodi Colony in Delhi in 1952.[455] Blacker, who studied under Julian Huxley at Oxford and served as secretary of the British Eugenics Society, had been selected by Margaret Sanger that same year to head up the new International Planned Parenthood Federation.[456] Blacker's study of contraceptive use in India lasted for two years, but ran up against design limitations and ended too early to publish results. Nevertheless, this first family planning study showed public health experts in India that rural populations might indeed be receptive to instruction in family planning and contraceptive methods on a wider scale.[457] More importantly, Koya's earlier work in Japan influenced the design and methodologies of the first two longitudinal studies of rural fertility supported by the Rockefeller Foundation and the Population Council in India: the Khanna Study, conducted in conjunction with Harvard University in rural Punjab from 1953 to 1960, and the Singur Study managed by the AIIH&PH in West Bengal from 1956 to 1964. As will be shown in the next section, similar concerns regarding fertility also influenced the agendas of Rockefeller-financed seed scientists working in South Asia during this period. Like their colleagues at the helm of projects of population regulation and surveillance, Rockefeller Foundation officials and

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[453] C. P. Blacker, "Dr. Yoshio Koya: A Memorable Story," *Eugenics Review* 55, no. 3 (1963): 153.
[454] Ibid., 154.
[455] Wyon and Gordon, 275.
[456] Connelly, 169.
[457] Wyon and Gordon, 275.

Indian seed scientists approached the issue of plant fertility and the hybridization of new, high-yielding strains of food crops as areas of prime concern for the security and longevity of the new nation. In this way, the regulation of both plant and human fertility proved critical within conceptions of national integrity and health.

HYBRIDIZATION AND THE IMPROVEMENT OF INDIA'S GERMPLASM

Ensuring the productivity of food grains emerged as a prime concern of Indian nationalists in the late colonial era, evolving through distinctly transnational exchanges. For instance, the October 1929 issue of the journal of the Sociedad Científica Antonio Alzate, one of Mexico's premier agricultural scientific societies, carried an article by the Marathi agronomist Pandurang Sadashiv Khankhoje. In it, he described new varieties of high-yielding maize under development at the Agricultural Research Station at Chapingo near Texcoco in the State of Mexico, highlighting recent crossbreeding work conducted by his research team to improve yields of the grain that was "of prime importance" in Mexican diets.[458] As a founding member of the Ghadr Movement, Khankhoje had left India in 1905 for Japan and then the United States.[459] There, he studied the agricultural sciences while organizing Indians on the West Coast of the United States, coordinating militant resistance efforts against the British Empire with Har Dayal, Lala Lajpat Rai, M. N. Roy, and other Indian nationalists exiled in North America.[460] While in the United States, he also worked toward graduate degrees in the agricultural sciences at the Oregon Agricultural College, the University of Minnesota, and State College of Washington. During the First World War, Khankhoje fought alongside German and Ottoman troops against British forces in the

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458 "'Algunos Productos Nuevos del Campo de Experimentacion de Agricultura en Chapingo, Mex.—Nuevas Variedades de Maiz' by P. S. Khankhoje," October 5, 1929, p. 361, Series 2, Articles by P. S. Khankhoje, P. S. Khankhoje Papers, NMML.

459 Savitri Sawhney, *I Shall Never Ask for Pardon: Pandurang Khankhoje* (Delhi: Penguin, 2008), ix-x.

460 Ibid., 148, 166.

Middle East and subsequently relocated to Mexico where he resumed his career as an agronomist for the Mexican Secretariat of Agriculture. Through the 1930s, he served as chief of the Office of Genetics, Ecology, and Botany in the Mexican Secretariat, directing research into high-yielding maize and wheat varieties at various agricultural experiment stations and research institutes across the country. He personally developed three varieties of high-yielding maize and four new rust-resistant wheat hybrids during his career in Mexico, directing the federal government's experiment station in Veracruz.[461] Nearly three decades after Khankhoje reported on the work being conducted at Chapingo, maize hybridization became the Rockefeller Foundation's first focus in crop improvement in South Asia. Building upon research conducted at Mexico's Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), not far from the same research station where Khankhoje worked on maize hybridization in the 1920s and 1930s, the Rockefeller Foundation launched its Indian maize improvement program after entering a formal memorandum of understanding with the Government of India on April 12, 1956. In welcoming Rockefeller's intervention in South Asian agriculture, India became the fourth nation to enter such an agreement with the Foundation.[462] Programs in Mexico, Colombia, and Chile preceded Rockefeller's Indian Agricultural Program (IAP), but the Indian investment would mark the foundation's largest project in the agricultural sciences to date.[463] With the Population Council already active in India for three years, the inauguration of Rockefeller's program to feed the subcontinent occurred against the backdrop of fully mature efforts to control the nation's population growth. Nick Cullather argues that

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[461] "Agricultural Activities of Dr. P. S. Khankhoje," p. 2, Series 8, Articles by P. S. Khankhoje, P. S. Khankhoje Papers, NMML.

[462] Guy B. Baird to K. C. Sodhia, June 1, 1967, Folder 11, Box 2, Series I, RG 6.7, General Administrative Files, RF, RAC.

[463] John D. Rockefeller III, "People, Food, and the Well-being of Mankind," April 9, 1962, p. 4, Folder 40, Box 6, Series I, RG 6.7, General Administrative Files, RF, RAC.

Rockefeller's launch of the IAP in 1956 set the stage for the food grain production increases of the Green Revolution of the late 1960s and 1970s. Motivated in part by Cold War politics, Rockefeller's introduction of new seed varieties, chemical fertilizers, and mechanized farming practices would ultimately triple wheat, and later rice, yields across South Asia.[464] For the time being, however, Rockefeller scientists would focus instead on gathering a genetic catalogue for the improvement of maize (corn) and sorghum (jowar), simultaneously building a scientific research network in India. Sorghum represented an important feed grain in India. Maize, however, had only been cultivated modestly as a food grain by Indian farmers — grown on just 7.6 of some 212 million acres.[465]

To serve as its new field director in India, the Rockefeller Foundation selected Ralph W. Cummings, an agronomist, soil scientist, and former head of the North Carolina Agricultural Experimental Station in 1956. Cummings arrived in Delhi with the primary goal of establishing a graduate school as part of the existing Indian Agricultural Research Institute (IARI) and, more generally, strengthening select agricultural education institutions, including the Allahabad Agricultural Institute. Working with these institutions, the foundation pursued the improvement of cereal crop production through scientific research initiatives in maize, sorghum, and millets through the late 1950s, and wheat and rice into the early 1960s. In these efforts, Rockefeller collaborated closely with the Indian Council of Agricultural Research (ICAR), which had been established by the British colonial administration in 1929. Further, Cummings also began to evaluate which food grains stood the best chance for improvement through hybridization across India.[466]

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[464] Cullather, 201.
[465] Harrar, Mangelsdorf, and Weaver, p. 8.
[466] Guy B. Baird to K. C. Sodhia, June 1, 1967, Folder 11, Box 2, Series I, RG 6.7, General Administrative Files, RF, RAC.

With a dedicated shift toward research-capacity building and improvements in food grain production, Cummings' small staff in Delhi moved to identify and finance ICAR and IARI research that would crossbreed high-yielding grain varieties which had already been identified in Mexico with local strains. The Rockefeller IAP thus set aside the social and economic concerns at the heart of debates surrounding rural development in India, approaching the problem as a clean equation that would pair improved seed varieties with fertile soil. Accordingly, Rockefeller's direct investments in Indian agricultural development proved relatively modest — a mere $7.9 million between 1953 and 1974, never involving more than twenty American scientists or foundation officials stationed in India at a time.[467] Comparable initiatives in India, led variously by the central government, the Ford Foundation, and the TCA, proved far more expensive for their emphasis on large-scale rural extension training and community development initiatives.

Rockefeller's on-going work in wheat, corn, and sorghum improvement in Mexico provided a clear model for the new IAP's work. There, Rockefeller's operations centered around CIMMYT, established at El Batán in the State of Mexico for its proximity to the Mexican government's premiere agricultural studies program at the Chapingo Autonomous University. Launched in 1943, CIMMYT served as Rockefeller's base of scientific operations in Mexico and focused on the study and improvement of maize and wheat varieties. The Mexican program involved about one hundred overseas staff and roughly twice that number of Mexican scientists and technicians.[468] Through the 1940s,

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[467] Uma Lele and Arthur A. Goldsmith, "The Development of National Agricultural Research Capacity: India's Experience with the Rockefeller Foundation and Its Significance for Africa," *Economic Development and Cultural Change* 37, no. 2 (1989): 309.

[468] J. George Harrar, "Transcript of Taped Interviews with Dr. J. George Harrar," 1979, p. 2, Folder 1, RG 12, Oral History Interviews, RF, RAC.

Rockefeller-sponsored research in Mexico had shown real potential in creating hybrid varieties of wheat that were both high-yielding and rust resistant.

Despite these successes in Mexico, the challenge of adapting the new hybrids to grow prolifically in the face of local pests and parasites, not to mention the subcontinent's infertile soil with its low moisture retention, appeared to be an insurmountable obstacle.[469] Agronomists Albert and Gabrielle Howard had worked on developing high-yield Indian varieties in collaboration with H. R. Khan at the Imperial Institute of Agricultural Research as early as 1905.[470] Still, the varieties developed by the Howards and Khan at the IARI proved to be too tall, leaving them vulnerable to wind, rain, and a host of parasites. As Harrar, Mangelsdorf, and Weaver observed in 1952:

> There is this situation with regard to wheat in India: Some excellent breeding work has been done, producing some good-looking plants. However, these varieties are not successful in terms of wheat production in India because they are not smut resistant, nor rust resistant, and are very susceptible to lodging. They even plant mustard in wheat to give the wheat something to lean against.[471]

In the face of these obstacles, the IAP would need time to build institutional capacity and to develop its relationships with the ICAR and the IARI before launching a domestic wheat improvement program that would rely upon a variety of field stations and experimental sites across India. Though work on improving domestic wheat varieties would continue at the IARI, the Rockefeller Foundation and the ICAR did not move to create a coordinated All-India wheat breeding program until late 1965, after the introduction of the hybrid wheat varieties developed under Norman Borlaug's supervision in Mexico.[472]

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[469] Ralph W. Cummings, "The Rockefeller Foundation Program in India," December 16, 1959, p. 2, Folder 32, Box 5, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC.
[470] S. P. Kohli, "Wheat Varieties of India," February, 1968, p. 17, Folder 544, Box 84, Series II, RG 6.7, New Delhi Field Office Records, RF, RAC.
[471] "Notes on Indian Agriculture: India Conference (including Pakistan and Ceylon)," March 26, 1952, p. 26, Folder 3, Box 1, Series 460, RG 1.2, Program and Policy, RF, RAC.
[472] "A Proposal for the Initiation of a Coordinated Wheat Breeding Scheme on an All-India Basis," February 1965, p. 1, Folder 547, Box 84, Series 2, RG 6.7, India Field Office, RF, RAC.

In much the same way, rice, by far the most cultivated and consumed grain in India, seemed to offer only difficult prospects for improvement as the Rockefeller IAP began its work in 1956.[473] Yet British colonial scientists had successfully isolated and cataloged high-yielding native strains of rice years before Rockefeller turned to seed hybridization in India. In 1929, for instance, Albert Howard reported that the agricultural scientists of the British administration had indeed been working on the problem of rice improvement:

> At practically all the rice stations, the Economic Botanists are actively engaged in the isolation of high-yielding unit species from the mixtures grown, in the testing of promising types, and in growing seed for distribution to the cultivators. This method of improvement is possible, as the amount of natural cross-fertilization in rice is small.[474]

Despite Howard's optimistic assessment two decades earlier, Harrar, Mangelsdorf, and Weaver reported to the contrary in 1952: "[W]e have been unable to discover any evidence of successful improvement of rice in India through hybridization."[475] Indeed, while the FAO's global program of rice improvement built from the notion of crossing Japanese varieties with the high-yielding rice varieties in other Asian nations, as would be accomplished at Los Baños in the Philippines by the International Rice Research Institute (IRRI) after 1960, daunting technical challenges remained in creating new hybrids.[476] Thus, the Rockefeller Foundation, owing in part to its conservative tendency to invest only when few other institutions tended to the problem and while dramatic gains seemed possible, did not launch a dedicated rice improvement program in India until the next decade,

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[473] Harrar, Mangelsdorf, and Weaver, p. 8.
[474] Howard, *Crop-Production in India*, 118.
[475] Harrar, Mangelsdorf, and Weaver, p. 9.
[476] Cullather, 163.

Instead, the IAP invested in sorghum and maize improvement. In India, this work sought to produce hybrids by crossing high-yielding Mexican strains of maize and jowar with local varieties that had grown up in South Asia over several hundred years.[477] The development of high-yielding maize varieties through hybridization relied upon a laborious process of isolating strains with prolific characteristics, and then the cross-pollination of thousands of varieties exhibiting the desired traits. Even at the highly successful CIMMYT program in Mexico, work on one strain could span several growing seasons with no guarantee of ultimate success.[478] As CIMMYT's report for 1948 concluded:

> A student of genetics can readily see why the development of better corn is a long time, step by step process. The perfect corn with its maximum yield potential, with maximum efficiency in the utilization of soil fertility and moisture and high resistance to insects and disease and with its maximum nutritive value is a goal to attain over a long period of years.[479]

Through its rigorous "application of modern principles of genetics," however, the maize program in Mexico boasted great gains in generating new, high-yielding hybrids.[480] The same process would be attempted in India, Cummings explained. The IAP, collaborating with the Indian Council of Agricultural Research (ICAR), sought to connect Indian agricultural field stations and test farms with maize germplasm from around the world.[481]

While the move toward maize hybridization using a large germplasm collection marked a shift in agricultural research in India, Dr. Boshi Sen had already attempted to hybridize Indian varieties with one another throughout the 1940s and 1950s in Uttar

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[477] Summary of Rockefeller Foundation Activities in Agriculture in India," August 1963, Folder 32, Box 5, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC.
[478] "Corn Breeding Program for 1948," 1948, p. 6, Folder 136, Box 11, Series 1.1, RG 6.13, Mexico Field Office, RF, RAC.
[479] Ibid., 2.
[480] Ibid.
[481] Ralph W. Cummings, "The Rockefeller Foundation Program in India," December 16, 1959, p. 2, Folder 32, Box 5, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC. Germplasm is essentially seed stock, but it also includes other plant material from which hybrids can be formed.

Pradesh.[482] Around the same time, province and state-level programs in Mysore and Punjab had worked to create two and three-way hybrids of Indian maize varieties. The IARI also launched its own maize breeding program in the early 1950s, but Rockefeller officials theorized that any substantial improvements in Indian maize yields via hybridization would require the introduction of genetic samples from North America for cross-breeding purposes.[483] Observing this, Boshi Sen coordinated with the U.S. Technical Cooperation Mission to India (TCM), the working arm of the TCA in the country, to supply the Jammu and Kashmir Government with parental stocks of an American variety of maize, US 13, which produced a successful test crop in 1955.[484]

In 1957, the ICAR and the Rockefeller IAP launched the Coordinated Maize Breeding Program, distributing American hybrids to test farms across India. The program simultaneously began to arrange for the importation of maize germplasm samples into India for the purposes of creating new hybrids. Four years later, the Rockefeller IAP's maize breeding program had released four new hybrid varieties of maize to farmers through their field collaborations with the ICAR and state-level agricultural research stations. Four more hybrids remained in the testing phase and had been scheduled for sale as seed to farmers by 1963.[485] This first batch of IAP-commissioned maize hybrids resulted from the cross-breeding of existing Indian varieties with "breeding material introduced from all parts of the world."[486] The names of the new hybrids conveyed their suitability for cultivation by farmers across India's ecological zones: Ganga 1, Ganga 101, Ranajit, and

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[482] "Agricultural Discussion Group of the Indian Agricultural Program of the Rockefeller Foundation," April 16, 1962, Folder 32, Box 5, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC.
[483] Ibid.
[484] Ibid.
[485] "Summary of Rockefeller Foundation Activities in Agriculture in India," August 1963, Folder 32, Box 5, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC.
[486] Ibid.

Deccan.[487] Under the right farming conditions the scientists of the ICAR expressed confidence that these new hybrid varieties of maize could thrive, becoming a significant food source for millions of Indians. As the 1963 survey of the IAP's work in India indicated:

> Under good cultural practices those hybrids have the capacity to yield up to 50% more grain than local varieties commonly grown under the same conditions in these same areas. Further they have been developed with grain type and quality which are acceptable to Indian cultivators and they are developed from inbred lines which are sufficiently vigorous and well adapted to permit dependable seed production under Indian conditions.[488]

The Rockefeller IAP's collaboration with the ICAR had delivered results suggesting that the Mexican model of innovation in food production — namely through a wide-ranging program of hybridization — could bear fruit for India. These experiments in crossing Indian maize varieties with the germplasm of Mexican and American maize strains produced new types of corn, well-adapted to the climate and soil conditions of South Asia. Indeed, as early as 1959, Cummings could boast that, "a good sample of the maize germ plasm of the world has been assembled for test."[489] Further, with their high-yields the new hybrids derived from this imported germplasm held the potential to become a significant supplement to the Indian food supply. Considering these successes and with national grain production levels still unsteady and fluctuating, the Government of India allocated Rs. 2.3 crores within 1961's Third Five-Year Plan to establish the National Seed Corporation to regulate the production of high-yielding, hybrid seeds.[490] In this way, the collaboration of the Rockefeller Foundation with the Government of India would take on an institutional

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[487] Ibid.
[488] Ibid.
[489] Ralph W. Cummings, "The Rockefeller Foundation Program in India," December 16, 1959, p. 2, Folder 32, Box 5, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC.
[490] Ibid.

dimension, pursuing permanent abundance through the collection, creation, and dissemination of seed material.

TOWARD A MODEL OF RURAL POPULATION CONTROL

Designed by a team of demographers and epidemiologists at the Harvard School of Public Health, the Khanna Population Study took shape under the direction of John E. Gordon and Theodore H. Ingalls of Harvard and Carl E. Taylor of the Christian Medical College in Ludhiana.[491] The Rockefeller Foundation initially funded the study through a grant awarded to Harvard in 1953, providing funds for two years and subsequently extending support for an additional five years. The Population Council would also provide funds for the project in later years.[492] India's Ministry of Health approved the study site of sixteen villages in the Ludhiana District in rural Punjab and enthusiastically endorsed the project. Gordon, Ingalls, and Taylor lived in the study area themselves for extended periods during their fieldwork, attempting to immerse themselves in the social context of their study subjects. The study sought to determine which of five birth control methods proved most effective for villagers and, as Population Council officials later reflected, "The overall program was designed along the lines of a laboratory experiment."[493] Indeed, the entire study area became an oversized laboratory for the Harvard team, with scientists collecting vast amounts of detailed data regarding their test subjects and culminating in a 400-page publication written by Gordon with John B. Wyon, and published by Harvard in 1971.[494]

The Khanna Study's results proved less significant than the sheer amount of information gathered on the villages of the Ludhiana District. In 1963, Gordon and his

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[491] Wyon and Gordon, 1-2.
[492] "India: The India-Harvard-Ludhiana Study," *Studies in Family Planning* 1, no. 1 (1963): 7.
[493] Ibid., 6.
[494] *See* John B. Wyon and John E. Gordon, *The Khanna Study: Population Problems in the Rural Punjab* (Cambridge: Harvard University Press, 1971).

colleagues reported that 38% of the couples in the experimental area had accepted foam tablets distributed by investigators or had indicated that they used either withdrawal or rhythm methods. That figure fell to 19% following the end of the study, with few women reporting that they used the foam tablets thereafter.[495] More importantly, the distribution of foam tablets and the instruction in various methods of contraception did not significantly affect the birth rate in the study area. As Gordon and Wyon reflected, "The probable explanation is that a goodly proportion of persons supposedly practicing contraception actually were not."[496] Subsequently, the Harvard scientists speculated that individuals with experience living or working outside the villages were more likely to engage in contraceptive practices, thus attributing the reluctance of their test subjects to accept their program of birth control to their identity as villagers and farmers. Indeed, Gordon and Wyon commented that villagers in the Ludhiana District relied upon a farming metaphor in their notion of conception, visualizing the woman as the soil and the man as the sower of the seed. As they described villagers' understanding in the published results of the Khanna Study: "During sexual intercourse the man puts his seed near the mouth of the womb. The woman is the soil; if the mouth of the womb is open and circumstances are right, the seed starts to grow and the woman is pregnant."[497] In this way, the Rockefeller-funded Khanna Study's epidemiological experiment in reproductive health education amassed a great deal of population data, generating more anecdotes and ethnographical observations than it did replicable models for village-level intervention.

For its part, the Government of India played an important role in facilitating these first efforts to study and shape family planning practices in rural India. For instance, Col.

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[495] "India: The India-Harvard-Ludhiana Study," 6.
[496] Ibid.
[497] Wyon and Gordon, 85.

Bishen Lal Raina, an officer serving with the Indian Ministry of Health, took the lead in coordinating efforts between the Population Council and the Government of India to support field studies of rural family planning. For instance, he spearheaded government efforts to provide the Khanna and Ramanagaram studies with supplies, including 100,000 Durafoam contraceptive tablets in 1957.[498] That same year and also with the field studies in mind, Raina secured agreements from Johnson & Johnson in the US and Durex in the UK to begin producing condoms in India, as prophylactics of Indian manufacture proved inferior.[499] Raina expressed enthusiasm for the family planning education work of the Population Council in his regular correspondence with the organization's top scientists, including Balfour and also Douglas Ensminger, director of the Ford Foundation in India. In 1957, for instance, Raina proposed that the Population Council support the Indian Directorate General of Health Services in launching a pilot education scheme in rural family planning. As he wrote: "At present time it is considered necessary to initiate a few schemes at least at soon as possible. These units will be tried in regions where the family planning programme is being actively pursued."[500] In response, the Population Council awarded Raina funds for film strips, books, and jeeps to support mobile education units that would travel from village to village, espousing the virtues of family planning.[501]

Meanwhile in West Bengal, the Singur Population Control Study, as it came to be known by officials of the AIIH&PH and the Population Council, began in 1956. Unlike the Khanna Study, the investigation at Singur was designed by an Indian institution, though its

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[498] MCB (Marshall C. Balfour) Diary excerpt, November 26, 1957, Folder 794, Box 83, Series 2, RG 2, Grant Files, PC, RAC.
[499] Ibid.
[500] W. Parker Mauldin to B. L. Raina., November 29, 1957, Folder 794, Box 83, Series 2, RG 2, Grant Files, RF, RAC.
[501] B. L. Raina to the Population Council, Inc., January 6, 1958, Folder 794, Box 83, Series 2, RG 2, Grant Files, RF, RAC.

objectives were shaped by the priorities of the Population Council funding it from New Delhi. Muktha Sen, who had directed WHO and FAO-supported investigations of nutritional and maternal health in the Singur Study Unit. took an active role in organizing the new population control study. She would ultimately lead the project, also rising to the directorship of the AIIH&PH by the end of the decade.[502] The study involved three villages: an experimental site, a control site, and a test site. Far more than its ultimate findings, the study's "family planning action research" methodology, involving the experimental deployment of different birth control programs, marked a new development within public health in independent India.[503] Supported by the Government of India, the work of this Population Council-financed project ran in parallel with the Rockefeller Foundation's simultaneous efforts to improve Indian food grains through hybridization.

In the West Bengali villages of the Singur Study Unit, what had begun as a series of Rockefeller-funded nutritional health surveys in 1944 evolved rapidly into an intricate investigation of family planning practices among the women of the Singur Health Unit. Muktha Sen, who had launched a broad survey of maternal mortality in 1951, now headed the new Population Council-funded investigation of family planning practices.[504] Around the Singur Study Unit, fifteen hamlets of the Gopalnagar Union served as the experimental area, with a similar number of sites used as the control within the Bandipur Union. The test site, the village of Mirzapur, was chosen as a venue in which the AIIH&PH field staff could refine their methods of sharing information about family planning while simultaneously developing a sense of current norms and common. [505] Sen and Mathen defined their study

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[502] "India: The Singur Study," 2.
[503] K. K. Mathen and Muktha Sen, "The Singur Population Study as an Action Research Model for Family Planning," June 1964, p. 11, Folder 785, Box 82, Accession 2, RG 2, Grant Files, PC, RAC.
[504] Ibid., 1.
[505] Ibid.

as "family planning action research," meaning that, unlike conventional demographic research, their work sought to address a pressing public health problem directly.[506]

Indeed, the eight-year-long Population Council-funded project sought to determine which methods of birth control proved most effective in reducing birth rates across the study area. Along with the distribution of contraceptive foam tablets and condoms, this work involved instructing villagers in contraceptive methods and tracking the sex and reproductive lives of the study's subjects through regular follow-up interviews. [507] Recognizing the area's low literacy rate, Sen and Mathen designed instructional materials that relied upon visual teaching aids, including flip charts, flash cards, and even wall calendars "with the picture of the national leader and their messages on family planning."[508] At the same time, Sen and Mathen noted that their methods of visual instruction ran into problems when deployed. As they wrote:

> To make the teaching of the 'rhythm method' simple, and at the same time thorough, charts to illustrate the physiology of human reproduction were prepared. Even these charts, in themselves, were found to be not so simple as they were supposed to be, and therefore at a later stage, models depicting the human anatomy and physiology were made.[509]

In this way, the field researchers of the Singur Study devised methods for convincing villagers to "accept family planning" that closely resembled the teaching materials widely deployed by the Ford-sponsored community development initiatives of S. K. Dey and rural extension trainings of Arthur T. Mosher, as shown in Chapter Two.[510] Indeed, covering a

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[506] Ibid., 10.
[507] Ibid.
[508] Ibid., 5.
[509] Ibid.
[510] Ibid. The message conveyed by these training materials also resembled the rhetoric of later Population Council-sponsored promotion media, particularly the 1967 short cartoon, *Family Planning,* which represented a collaboration between the Population Council and the Walt Disney Company. Translated into twenty-four languages, the cartoon featured Donald Duck and a narrator outlining the virtues of small families achieved through active planning. See, Connelly, 264.

target population of 7,423, the educational dimension of the Singur Study and its broad effort to reduce birth rates through practical instruction closely resembled the intricate social interventions that the Rockefeller Foundation had earlier sought to avoid.[511] In some sense, such interventions were simply inevitable, given the outsized aims of any endeavor to change people's lives in the most intimate of ways. In pursuing the goal of fertility reduction, the Population Council could hardly maintain the pretense of tending strictly to scientific research as could the Rockefeller Foundation.

Working with AIIH&PH demographers C. Chankrasekaran and R. N. Basu, the physicians at the helm of the Singur Study recruited six male and female fieldworkers from the villages surrounding the study sites to support the project. They served as interviewers and monitors of the villagers in the study area, following up with women who failed to report to study centers, similar to practices employed by physicians and medical investigators in field studies of family planning conducted in Trinidad, Jamaica, and Barbados, during the 1940s and 1950s, as Nicole Bourbonnais has shown.[512] These fieldworkers also served as educators, carrying flipcharts and flannel cutouts with which they were expected to explain human reproductive processes to reluctant villagers.[513] To facilitate their work, Muktha Sen and K. K. Mathen composed a handbook setting out the objects of the study and detailing the methods they might employ in their work. As the fieldworkers' guide explained:

> We want to see that everybody had got a child [sic]. But the number of children and interval of pregnancy should be such as you can make your family happy and prosperous. We are increasing in number but our land remains the same. Land is

511 "India: The Singur Study," 1.
512 Bourbonnais, 52-53.
513 Mathen and Sen, p. 6.

> the only source for supplying us food. The same amount of land cannot feed the increasing number of mouths. So it is not desirable to have many children.[514]

The short, frank sentences of the guide to field workers distilled the enormous issue of overpopulation, reframing it in practical terms deemed digestible by villagers and fieldworkers alike. In this way, the Singur study presented family planning as a matter of sheer common sense in the face of the scarce land and low income in the villages. The land itself simply could not feed villagers' numerous children. At the same time, this simple message ran into trouble, especially when the family planning methods — restricted by the study design to the use of condoms, contraceptive foaming tablets, and the rhythm method as the only strategies acceptable to villagers — did not achieve their desired results. As Sen and Mathen observed: "One of the most difficult problems the study faced was due to cases of genuine failure of methods advised and practised. There were a number of cases when people blamed the field workers for 'misleading' them, and asked for remedies by abortion."[515] In spite of the flaws within its methodologies, the Singur Study demonstrated a small but consistent decline in pregnancies in the experimental area.[516] It maintained the full support of the Population Council through the end of its data collection stage in 1963. Indeed, the Population Council featured the Singur Study prominently in the first edition of its bulletin, *Studies in Family Planning,* alongside the Khanna Study and the Emko Program in Puerto Rico.[517]

The Khanna and Singur studies do much to show that the Rockefeller Foundation and the Population Council forwarded their public health agenda — an unambiguous plan of rural population control — under the guise of objective demographic research. In doing

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[514] "A Guide to Field Workers: The Necessity of Family Planning," 1959, p. 1, Folder 786, Box 83, Series 2, RG 2, General Correspondence, RF, RAC.
[515] Mathen and Sen, "The Singur Population Study," 5.
[516] "India: The Singur Study," 3.
[517] Ibid., 1-4.

so, the two organizations worked closely with the Government of India and local public health institutions. The major focus of these efforts at controlling India's population fell upon the nation's rural poor. As Sarah Hodges argues: "The neo-Malthusianism that undergirded population control projects in newly independent India sought to eradicate poverty by intervening directly and robustly in the reproductive practices of all Indians."[518] That said, as she further notes, "it was the poor whose bodies bore the brunt of the state's attempts to reduce the aggregate rates of population growth."[519] In much the same way, as it emerged as an influential force in public health in the late 1950s and early 1960s, the Population Council worked through Indian institutions to focus its fertility regulation efforts on Indian villagers struggling with the effects of food shortage and malnutrition.

CONCLUSION

At the eleventh annual meeting of the Food and Agriculture Organization of the United Nations in Rome on November 6, 1961, John D. Rockefeller III delivered a keynote address to the agricultural and nutritional scientists of the UN agency. In it, Rockefeller reviewed the successes of his family's foundation in improving agriculture in Mexico and outlined ongoing efforts to diversify the food supply through scientific innovation in India and across Asia. As the founder of the Population Council, he also underscored the need to address the global problem of overpopulation, which he ranked as "second only to atomic weapons" as the most pressing issue of the day.[520] He called for addressing the problem head-on through candid family planning initiatives tailored to each nation's needs.[521]

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[518] Sarah Hodges, "South Asia's Eugenic Past," in Alison Bashford and Philippa Levine, *The Oxford Handbook of the History of Eugenics* (New York: Oxford University Press, 2010) 236.
[519] Ibid., 237.
[520] John D. Rockefeller III, "People, Food, and the Well-being of Mankind," November 6, 1961, p. 10, Folder 40, Box 6, Series I, RG 6.7, New Delhi Field Office Records, RF, RAC.
[521] Ibid., 9.

Strikingly, he also reflected upon a rush to abstraction in the scientific effort to strike a balance between food production and population growth. He remarked:

> [I]t is essential that we see in its full and true dimensions the problem of numbers of people versus quantities of food. From the days of Malthus, we have inherited a tendency to feel that the answer lies in striking a healthy balance between these two. To the difficult question "How much is enough?" this allows a simple answer, but too often the wrong one, because it equates man with animal and food with fodder.[522]

To avoid dehumanizing the populations in the race to counter the crisis, Rockefeller proposed that private foundations, governments, and international agencies like the FAO and the WHO remember that "all these basic needs — food, health, education, economic betterment, and population stabilization — are bound together."[523] Further, Rockefeller asked whether work on these inherently connected issues had perhaps neglected social and educational development.

Indeed, the previous year, Rockefeller had delivered a very similar speech to the Dallas Council on World Affairs in April 1960. In it, he remarked that, "Our constant goal must be the enrichment of human life, not its restriction," and reflecting that, despite all of his family's organizations work to the contrary, "Large populations are not necessarily undesirable."[524] In this way, Rockefeller presented very serious ethical questions regarding the quest his own organization had undertaken to address the perceived double crisis of food shortage and overpopulation. He also demonstrated how such vast programs intimately affecting the lives of millions of people hinged upon the mercurial whims of a handful of powerful individuals.

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[522] Ibid., 6.
[523] Ibid., 7.
[524] "John D. Rockeller 3rd on a Citizen's Perspective on Population," *Population and Development Review* 38, no. 4 (2012), 731.

Rockefeller Foundation officials had rejected the prospect of vast social and economic interventions in India during their initial discussions in 1951 and 1952. Instead, the foundation's approach to agricultural intervention and investment in India drew directly from a scathing critique of the socially-oriented designs of the nascent community development movement that had emerged in part from post-Partition rehabilitation efforts, as shown in the previous chapter. Community development and rural extension, while supported staunchly by the Government of India, the Ford Foundation, and the TCA through the early 1950s, embodied a resource-intensive model focused on social intervention that the foundation sought to avoid.

At the same time, Rockefeller's decision to invest in the agricultural sciences in India hardly meant that the organization would abandon its running concern for public health or its postwar fixation upon overpopulation. Instead, Rockefeller organizations simply pursued social interventions of a different, more invasive, and clinical nature. Indeed, the new focus on the agricultural sciences in India represented a social experiment itself, transplanting the model that had successfully improved Mexican grain yields into a newer, larger national context. The deep concern for overpopulation expressed by Rockefeller's top administrators and scientists was simply channeled into its sister organization, the Population Council, which from 1952 aimed to evaluate and regulate fertility across India.

Chapter Five: Pursuing Permanent Abundance

After leading two lives as a freedom fighter within the Ghadr Movement and as an accomplished agronomist of Mexico's Secretariat of Agriculture, Pandurang Khankhoje finally returned to an independent India in April 1949.[525] His work on maize hybridization during his forty year exile brought him esteem and recognition within the Indian agricultural science community, but his advanced age kept him from assuming a powerful role within the Indian Ministry of Agriculture.[526] Upon his return to South Asia, he and his family took up residence in Nagpur where he continued to write regularly on topics in Indian agricultural development. In 1949, he headed an agricultural advisory committee to the state government of Madhya Pradesh, helping to assess the quality of agricultural education programs and experimental farms and stations in the region.[527] Khankhoje recommended the wider mechanization of Indian agriculture, lending support to the expansion of India's agricultural education and rural extension programs.[528] He wrote in support of India's community development program, stressing the need for practical scientific research that "lead to more yields with minimum expense to the farmer."[529] He also expressed dismay at the lack of attention the agricultural sciences had paid to soil fertility in India, speculating that low crop yields derived from a lack of attention to the soil. As he wrote in 1958:

> Thousands of years of agriculture have made the soil less fertile or unfertile. Our land erosion is so great that the present fertility of the soil is reduced to the minimum, and in our general practice we have practically ignored the

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[525] Sawhney, 279.
[526] Ibid.
[527] Ibid., 280.
[528] P. S. Khankhoje. "'Research, But of a Practical Kind,' Reprinted from *Indian Farming,*" August 1958, p. 1, Khankhoje Papers, S. No. 10, Articles by P. S. Khankhoje, NMML.
[529] Ibid.

> fundamental principles of fertilizer, seed selection, introduction of new crops and up-to-date modern agricultural methods.[530]

Indeed, the former Ghadri was not alone in his concern that soil erosion and infertility stood in the way of agricultural production increases. Just as Khankhoje argued, scientists of the international agencies and American philanthropic organizations now deeply involved in reshaping Indian agriculture came to contend that high-yielding seeds would not, on their own, generate dramatic increases in food grain production. Their concern over soil health and crop yields would play out most vividly in the partitioned Punjab.

In the two decades following independence, the Indian and Pakistani governments coordinated with new international institutions like the World Bank to codify their shared borders and to secure the water and soil resources needed to expand agricultural production in South Asia. During the 1950s and 1960s, the World Bank's component institutions — the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) — sent prominent bankers, lawyers, hydrologists, and economists to the South Asia to assist in defining the international boundary. These Bank representatives also worked to gather data to inform institutional lending and publically advocated for population management and agricultural investment. In attempting to define and regulate national spaces and populations, such as World Bank projects, they endeavored to integrate India and Pakistan into an emerging international political and economic order.

This chapter examines projects launched by the Government of India in conjunction with the Rockefeller Foundation, the Ford Foundation, and the World Bank to permanently sustain food grain production increases across South Asia. It examines the World Bank's

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[530] P. S. Khankhoje. Unpublished article entitled, "Mukta-Grama Movement: Self-supporting and Productive Village," 1955, p. 1, Khankhoje Papers, S. No. 4, Articles by P. S. Khankhoje, NMML.
[530] Ibid.

mediation of the Indus River Basin dispute of the 1950s and subsequent economic missions that supported the framing of the Indus Waters Treaty between India and Pakistan in 1960. As emissaries of international development schooled in the public works projects of New Deal and resource-sharing agreements across the Americas, World Bank representatives framed proposals for South Asia firmly in the context of a postwar population crisis. Rather than focusing exclusively upon the hydro-political and legal implications of these negotiations, this chapter emphasizes concerns over fertile soil as a vital national resource that dominated the discussions. World Bank economists and hydrologists intent on securing a permanent settlement of water rights in the Indus River Basin paid particular attention to issues of soil fertility and the long-term productivity of the land. These considerations drove the negotiations between India and Pakistan, reflecting a broader thinking on the connections between soil health, agricultural vitality, and national integrity.

In their negotiations, World Bank officials and the legal teams representing both nations also drew upon international boundary and resource-sharing agreements between the United States and Mexico as models for dividing the natural resources of the Indus River Valley. In this way, a rising class of international development experts and elites worked to codify the exchange relationships of South Asia's new border regions, systematizing the international border between two nations. For Indian, Pakistani, American, and British officials involved in the discussion, a final settlement of the boundary and resource disputes between India and Pakistan facilitated rapid agricultural development and offered a solution to the perceived population crisis.

During the same period, the Rockefeller Foundation collaborated with the Indian Council of Agricultural Research (ICAR) to launch the National Seeds Corporation, a company that would have long-term rights over managing India's existing seed resources and newly-developed hybridized varieties. Rockefeller and the ICAR thus attempted to

establish lasting legal and economic institutions that would secure high crop-yields despite the relative infertility of regional soils. Finally, after the launch of the Rockefeller Foundation's Indian Agricultural Program (IAP) in 1956, the foundation took on a powerful role within the Indian Agricultural Research Institute (IARI). Notably, the IAP advocated for the establishment of graduate programs in agriculture, such as the Punjab Agricultural University in Ludhiana, and the advancement of soil science in India through investments in field research. Crafted in the image of the agricultural programs of the American land-grant universities, these new institutions would work to train agricultural experts who would maintain the nation's seed and soil resources for generations to come. In this way, these global institutions collaborated with the Indian and Pakistani states to articulate distinctly national conceptions of fertility in the form of soil and seed resources. As will be shown, only after these efforts in establishing institutions and networks intended to guard and maintain these resources would the Rockefeller Foundation turn to intensive efforts to develop high-yielding wheat and rice varieties across South Asia.

A DIVISION OF WATER AND SOIL

During the summer of 1947, the British barrister Cyril Radcliffe famously labored in a guest cottage on the grounds of the Viceroy's House in New Delhi, hastily drawing the border between two emerging nations. On his first and only visit to South Asia, the line his pen left across the map of the subcontinent delimited the national territories of India and Pakistan.[531] Situated in the northwestern quarter of the Indian subcontinent and spanning much of modern-day Pakistan, the Indus River system consists of two major rivers in the west: the Jhelum and Chenab, and three to the east: the Sutlej, Beas, and Ravi.

[531] Zamindar, 27.

The five rivers are tributaries to the larger Indus River.[532] The Radcliffe Line bisected the Indus River system in 1947, leaving the rivers' headwaters largely in Indian-administered Himalayan regions. Both nations subsequently laid claim to much of the water flowing through the Indus Basin and, in the view of World Bank officials, threatened agricultural production on both sides of the new border.[533] As Vazira Zamindar has shown, however, Partition did not represent a final territorial and economic settlement between India and Pakistan.[534] The political barrier cutting through the agricultural heartland of Punjab cut irrigation canals off from their headwaters, disrupted the flow of food grains to markets, and determined the movement of agrarian laborers. In this way, decolonization left the future of Indian and Pakistani agriculture uncertain. Like their counterparts at the Ford and Rockefeller foundations, World Bank officials contended that South Asia faced a population crisis, with the collective population of both nations projected to exceed one billion by 1990.[535]

The dispute remained unresolved through the first four years following Partition. The need for a final settlement over resources in the wake of Partition also drew immediate attention from international development experts, but the situation seemed to demand diplomatic as well as economic expertise. As Norris E. Dodd, the director of the FAO, wrote in February 1953: "The partition between Pakistan and India has created very serious problems in international water rights for the control and use of the Indus River and its

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[532] David Gilmartin, *Blood and Water: The Indus River Basin in Modern History* (Berkeley: University of California Press, 2015), 14-15.
[533] "William Iliff Oral History Transcript," p. 48-9, 1961, IBRD/IDA Oral Histories, Folder 44, World Bank Group Archives (WBG).
[534] Ibid.
[535] "Fifty-Year Population Projections," 1958, Folder 1840725, India – General – General Negotiations – Correspondence, Vol. 2, WBG.

affluents."[536] In 1951, David E. Lilienthal, the American attorney who directed the Tennessee Valley Authority (TVA) in the 1930s and had more recently chaired the U.S. Atomic Energy Commission, attempted to broker a water-sharing deal between India and Pakistan.[537] As Daniel Haines has shown, Lilienthal's proposal proved significant in that it defined the Indus River Basin as a "natural" feature of the local environment — a discrete geographical unit that could be divided.[538] It also attempted to establish a cooperative agricultural development project between India and Pakistan. For all its potential, and in spite of Lilienthal's years of engineering and management experience with the TVA, negotiations collapsed within the year. Following the failure of the Lilienthal's cooperative development plan, World Bank President Eugene Black took an interest in the dispute and, in 1952, secured dedicated resources for the IBRD to adjudicate a settlement treaty between India and Pakistan. The World Bank's effort in resolving the dispute would involve engagement with former British colonial officials and bureaucrats, as well as development experts, such as Lilienthal, drawn from large infrastructural projects in the United States and Latin America. William A. B. Iliff, for instance, represented the former category. Iliff departed a long career with the British Treasury to join the World Bank Group in February 1948, where he served as vice president of the International Development Association (IDA) from 1956 to 1962.[539]

In his experience with the British Government, Iliff had worked as financial counselor to the British embassies in Teheran, Cairo, and Addis Ababa, and also as the

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[536] Norris E. Dodd to F. T. Wahlen, February 9, 1953, File 10DIR346, Land and Water Use Branch Files, Agriculture Division, FAO.
[537] Daniel Haines, "(Inter)Nationalist Rivers?: Cooperative Development in David Lilienthal's Plan for the Indus Basin, 1951," *Water History* 6, no. 2 (2014): 132.
[538] Ibid.
[539] Ibid.

financial advisor to the Governor of Burma at Simla during the Second World War.[540] Now in his new role with the IDA, Iliff's extensive British colonial and overseas experience made him the World Bank's choice to serve as its chief financial representative in South Asia during the mediation of the Indus River Basin dispute. For Iliff, the World Bank's decision to work on resolving the dispute stemmed from concerns regarding population growth and development. As he reflected in a 1960 interview: "We had been interested in the development of both India and Pakistan, who together, population-wise anyway, probably comprise about half the total population of the underdeveloped world."[541] In this way, the World Bank could test its plans for global economic growth to the world's largest populations and, in turn, produce the greatest impact.

At the same time, Iliff believed that the resource dispute between India and Pakistan and the lack of a firm resolution regarding resource-sharing in the subcontinent's most productive agricultural region could permanently hinder economic growth for both nations: "If development was to go ahead, it was very necessary that we should find a situation where there were not matters such as serious disputes with economic consequences between the two countries."[542] In short, the Indus River Basin dispute threatened economic stability in one of the world's most heavily populated regions. World Bank officials justified their unprecedented involvement in arbitrating the bilateral treaty on these grounds, firmly framing the dispute as a hindrance to agricultural development and, by extension, a contributor to broader food and population crises.

After entering discussions with both India and Pakistan in 1952, the IBRD's mediation of the Indus River Basin dispute unfolded over the course of a decade. It would

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[540] "William Iliff Oral History Transcript," p. 42, 1961, Folder 44, IBRD/IDA Oral Histories, WBG.
[541] Ibid., 48.
[542] Ibid.

involve the submission and resubmission of numerous proposals from the Indian and Pakistani delegations, as well the revision of comprehensive plans compiled by World Bank staff. In these successive negotiations, officials representing both nations and the World Bank turned to a handful of international precedents in justifying their proposals. They also emphasized the fertility of the soil, and not merely the security of water resources, within the two national domains that shared the Indus River Basin. Critically, the division of the Indus River system would mean sharing its rich soil as well.

THE QUEST FOR HEALTHY SOIL

In cooperation with Indian and Pakistani legal teams, the experts of the World Bank drew upon the model of the U.S.-Mexico border to formalize the British-authored boundary cutting through the Indus River Basin. In doing so, they assumed the adjudication of boundary and water disputes between the United States and Mexico as standard protocol in international disagreements over resources, replicating institutions and practices developed in the North American context. Further, all three parties sought the advice of experts who had worked to resolve international resource disputes arising along the U.S.-Mexico border.

In October 1953, for instance, American engineer R. J. Tipton reviewed India's initial proposal for the settlement of the Indus River Basin dispute and delivered his assessment of the plan to the IBRD. Working at the behest of the IBRD, Tipton drew upon three decades of experience in evaluating interstate and international water disputes. As principal of the hydrological consulting firm, Tipton and Kalmbach, Tipton had helped to negotiate the 1944 Mexican Water Treaty, which determined international water rights on the Rio Grande, Colorado, and Tijuana rivers. Now, as Tipton assessed dueling national claims over rights to the Indus River Basin, he concluded that India's proposal would

shortchange West Pakistan. Indian planners, he argued, had overstated West Pakistan's capacity for drawing irrigation water from tube wells. Reviewing several decades of British colonial data collected in surveys of the capacity of the river system, Tipton concluded that the Indian proposal greatly underestimated the amount of Himalayan river water that would be needed to support Pakistani agriculture. India, he contended, proposed to draw far too much water for its own agricultural use, threatening West Pakistan's food security.[543] In concluding his report, Tipton cited his qualifications in assessing hydrological claims, emphasizing that his model had been proven accurate through tests across Latin America. As he wrote in late 1953:

> It is the method being used by the Ministry of Public Works of Venezuela, for whom we are consultants, in all of its planning with respect to river development, and has also been used in connection with other river developments in South America and in Mexico with which I have been identified.[544]

In this way, Tipton's assessment represented the voice of international development expertise, promoting a set of norms formulated through similar negotiations between the U.S. and Mexico and a broader professional expertise built in Latin America. It also marked the beginning of a long relationship between Tipton and the IBRD. In effect, the World Bank tasked Tipton with the evaluation of the proposals and estimates of both nations through the conclusion of the Indus Waters Treaty in 1960. In contracting his firm, the IBRD took a one-size-fits-all approach to settling the international dispute, drawing upon expert knowledge in border and resource management, taken largely from experience in the United States and Latin America. This emerging body of international development expertise would be deployed in South Asia, evolving in a pattern shaped in part by the priorities of the new Indian and Pakistani states.

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[543] "'Comments on India's Draft Outline of Plan' by R. J. Tipton," 1953, Folder 1787294, Indus Basin Dispute – India Comprehensive Plan – Correspondence, WBG.
[544] Ibid.

Similarly, the legal representatives of India and Pakistan themselves turned to earlier examples of river management along the U.S.-Mexico border in formulating their proposals for the Indus River Basin. By 1957, Pakistani officials began to express concern over the effects of India's proposed hydroelectric dams on the Indus River system. They argued that, in addition to affecting the flow of water reaching West Pakistan, India's dams would permanently alter the channels of the rivers downstream.[545] In justifying their concerns, the Pakistani delegation petitioned the IBRD, citing the effects of dams constructed upon river systems spanning the United States and Mexico. Pakistani officials pointed to instances of channel degradation observed on the Rio Grande after the construction of New Mexico's Elephant Butte Dam in 1927 and following the completion of Boulder Dam on the Colorado River in 1935.[546]

Pakistani reports showed that in both cases on the U.S.-Mexico border, dams on the river systems spurred a rapid build-up of sediment, causing a narrowing of river channels downstream and a degradation of river banks. These changes, observed by American and Mexican geophysicists and hydrologists over several decades, reduced the carrying capacity of both rivers, increased the frequency of flooding, and promoted soil erosion and degradation in agricultural areas. The potential for Indian dam construction in the Himalayas to facilitate flooding across West Pakistan proved particularly sobering for the Pakistani delegation, especially considering the similarities between the arid climate of the mountainous American Southwest and that of West Pakistan. As their report concluded: "If India's flood storage is inadequate to contain flood waters and peak floods are permitted to pass into Pakistan from time to time, aggradation of river channels would be greatly

[545] "Channel Deterioration and Initial Corrective Works Required," 1957, Folder 1787389, Indus Basin Dispute – Pakistan's Estimates of Bank's Plan – Correspondence, WBG.
[546] Ibid.

increased."[547] This process could result in the increased deposition of nutrient-rich materials into the beds of the rivers flowing into Pakistan from the Himalayas. Without this nutrient-rich soil overflowing or deposited into West Pakistan's farmlands, India could thus wield the power to degrade West Pakistan's soil and derail the nation's food economy.

Beyond such fears of agricultural sabotage, the Pakistani delegation also preoccupied itself with determining the costs of the unintended consequences of water development projects upstream in northern India. The Pakistani team turned to historical examples from international water management in North America to demand, in October 1957, that preventative measures be built into the final Indus River Basin settlement with India.[548] Indeed, American and Mexican experience on the Rio Grande and Colorado River systems lent an air of urgency to Pakistan's claims. In both historical examples, the degraded river channels required emergency restructuring, costing both governments tens of millions of dollars.[549] American engineers eliminated bends in the Rio Grande, increasing the river's gradient to force out sediment and reduce the build-up of vegetation along the riverbanks, while simultaneously making efforts to prevent soil erosion. The Pakistani delegation noted that engineers from the United States and Mexico also scrambled in the wake of the construction of Elephant Butte Dam in New Mexico to construct canals, levees, and auxiliary dams to salvage the rapidly deteriorating channels.[550] In particular, the construction of the Hoover Dam and the Parker Dam on the Colorado River system also drew the attention of Pakistan's representatives. In that case, dam construction on the American side of the border had severely degraded the rich farmlands of the Colorado River Delta in Sonora, prompting the cooperative International

[547] Ibid.
[548] Ibid.
[549] Ibid.
[550] Ibid.

Boundary and Water Commission (IBWC) to compel both governments to invest in a restorative levee system. Considering these examples, the Pakistani delegation argued for access to World Bank loans to fund river channel construction downstream from the Indian dams. Pakistani officials also successfully lobbied for provisions in the final treaty that prohibited India from undertaking disruptive alterations to their upstream portion of the rivers entering Pakistan. In this way, the Indus Waters Treaty protected Pakistani agriculture and ensured the nation's food security.

In late 1959, the IBRD's legal team submitted a proposal for the mutual inspection of water management projects in response to Pakistani concerns regarding the regulation of international river flow. This proposal included a selected survey of existing water treaties, justifying exchanges of inspectors to counter abuses and ensure the proper maintenance of international river systems. Here again, agreements between the United States and Mexico featured prominently. First referenced among them was the Rio Grande Rectification Convention of 1933, which established the International Boundary and Water Commission (IBWC) as the bilateral entity tasked with inspecting hydrological projects in both nations.[551] The IBRD entered provisions for a similar cooperative monitoring institution, the Permanent Indus Commission, into the final Indus Waters Treaty. Referencing the Rio Grande, Colorado, and Tijuana Treaty of 1944, representatives of the Bank also argued for provisions enabling India and Pakistan to engage in the construction of joint waterworks, as well as providing funding and personnel for regular inspections of the river system on both sides of the border. In this way, negotiations between India, Pakistan, and the World Bank served to create a formalized international boundary between

[551]"Treaty Provision Providing for the Inspection of Works or Sites in One Country by Representatives of Another," 1959, Folder 1787793, India – Pakistan – Indus Waters Treaties – Agricultural Use by India – Correspondence, WBG.

the two nations, replete with the institutions and practices derived from relations between the United States and Mexico.

HEALTHY SOIL, HEALTHY NATION

Contained within discussions and plans surrounding water rights in the Indus River Basin, concerns over soil fertility shaped the negotiation of the Indus Waters Treaty of 1960. More broadly, the notion that securing fertile soil would be critical to the survival of the two new nations dominated the thinking of the scientific experts of the World Bank and the Ford and Rockefeller foundations through the 1950s and into the early 1960s. Evaluating and promoting the quality of the subcontinent's soil had been, of course, an important focus of colonial agricultural science as well. The imperial economic botanist Albert Howard, for instance, understood a clear connection between soil health and the dual problem of population growth and food supply. As he wrote in 1924, "The development of agriculture in India demands three conditions — water, combined nitrogen, and better cultivation."[552] Specifically in the context of wheat cultivation in river basins of northern India, he observed:

> The immediate problem in wheat-production on the alluvium is the development of the means by which the present extensive system of agriculture can be intensified. For intensive cultivation the indigenous varieties are quite unsuitable. The new varieties, however, respond successfully to better soil conditions. Besides a suitable variety, two other things are required, namely, water and organic matter.[553]

In this way, the balance between the right kind of soil and the appropriate quantity of water would directly determine the amount of food grains that could be produced in a given region. Howard's influential thinking on the matter held that certain kinds of soil could produce particular varieties of wheat. Over time, water could alter the balance of the soil,

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[552] Howard, *Crop-Production in India*, 80.
[553] Ibid., 107.

making it difficult for cultivators to grow particular strains in certain areas. Further, the alluvial soils of the Indus Basin within the "canal colonies" of the province of Punjab could be expected to support vast quantities of wheat, provided the soil was properly fertilized.[554]

Another colonial agronomist, John Russell, who directed the Rothamsted Experimental Station in Hertfordshire, evaluated the capacity of imperial research in agriculture across the Sind and Punjab through 1936 and 1937. As part of a wider assessment of the workings of agricultural research in India, he issued a 1939 report on the work of the Imperial Council of Agricultural Research (ICAR) in "applying science to crop production" in India.[555] He observed that the complex relationship between soil fertility and water supply in the canal colonies of the Punjab presented real difficulties in estimating the productive capacity of the land. As he wrote:

> The problem of explaining soil fertility on chemical and physical grounds is extremely difficult, because of the profound effect of water supply and of climate, and if any future investigation on the subject is started, it should from the outset be associated with an elaborate system of carefully planned field experiments. The work would, however, be costly and troublesome and I doubt very much whether it would be worth the expense.[556]

As Russell indicated, a thorough analysis of soil fertility in Punjab province proved to be prohibitively expensive, if not entirely impossible in the late colonial period. Nevertheless, the colonial concern over soil health in connection to population issues was an enduring one. As Alison Bashford writes: "Symbolically, politically, economically, and literally, soil was the substrata of the population problem. It makes sense, then, that agricultural science was the expertise base for many population commentators."[557] As Bashford explains, the

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[554] Ibid.
[555] John Russell, *Report on the Work of the Imperial Council of Agriculture Research in Applying Science to Crop Production in India* (Delhi: Manager of Publications, Government of India, 1939), 139.
[556] Ibid.
[557] Bashford, 181.

nitrogen and phosphate content of soils evolved as a central area of concern for global population experts through the early twentieth century.[558] As soil experts noted, nutrient-rich soils could generate higher quality food grains in higher yields, thus sustaining healthier populations. In the Indian context, the former colonial agronomist G. A. Haig observed that the use of chemical fertilizers by farmers in pre-Partition India had been virtually nonexistent. This apparent lack of concern for soil health on the part of India cultivators, he reasoned, stemmed from superstition. As he wrote after retiring from his post in the Punjab following independence:

> My impression is that when I left India in 1947 most of the administrative and district officers (who really run the agriculture of the country) belonged to the "Muck and Mysticism" School and were frightened of artificial fertilizers. […] Modern informed ones seem to be strongly in favour of artificial fertilizers and I think it can be taken that it is now most desirable that these should be "pushed" in India and Pakistan.[559]

Inheriting Haig's concern for soil health and advocacy for the expanded use of "artificial" fertilizers, the Rockefeller-financed Punjab Agricultural University in Ludhiana took up the cause of soil health advocacy in the region. Proposed by the IARI in 1959 and opened with the support of the Rockefeller Foundation in 1962, the new university emphasized both undergraduate education and graduate-level research, devoting extensive resources toward work in soil science and supporting the expanded use of chemical fertilizers.[560] New projects to be carried out by the university under the Third Five-Year Plan included the establishment of five regional soil testing laboratories, the launch of a land use soil survey, and the construction of ten soil conservation demonstration farms to focus upon

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[558] Ibid., 183-184.

[559] G. A. Haig, "Dr. Norman Wright's Tour to Australia, India, etc.," November 5, 1949, India: food situation and future U.K. policy, MAF 83/2168, The National Archives of the UK (TNA).

[560] "Draft Plan of the Rural State University, Ludhiana Act," 1959, p. 7, Folder 659, Box 99, Series V, RG 6.7, New Delhi Field Office, RF, RAC.

arid farming methods. Further, a dedicated soil conservation wing would be added to the university to support the expansion fertilizer trial being carried out on the fields of local cultivators.[561]

SHAPING THE FUTURE OF AGRICULTURE

Divisions ran among the representatives of the World Bank and the Ford Foundation and Indian and Pakistani government officials over how best to address the division of water — and, by extension, soil — resources in light of the postwar population boom. Conflicts emerged, however, not between imperialist and nationalist or even between Indian and Pakistani interests, but rather between those who understood famine as resulting from inadequate food supply and others who saw it as a failure of distribution. For many of the development experts of the Ford and Rockefeller foundations, as well as the economists of the World Bank, the outbreak of famine signified the necessary, albeit regrettable, outcome of overpopulation. It came as the total breakdown of a nation's food economy — the logical result of inefficient agricultural production stretched to its limits. Yet, in estimating the agricultural needs of India and Pakistan while negotiating the Indus Waters Treaty, clear tensions emerged among officials over how best to prevent future food crises.

Retired U.S. Army General Raymond "Speck" Wheeler, for instance, served as the chief engineering advisor to the Indus Waters Project. In this capacity, Wheeler oversaw estimates of the agricultural production capacity of the Indian and West Pakistani border regions. The Illinois-born general had served on Admiral Louis Mountbatten's staff within the South East Asia Command during the Second World War. After the war, Wheeler served as Chief of Engineers for the Army Corps of Engineers and managed the clearing

[561] Ibid.

of the Suez Canal following the crisis of 1956. An accomplished engineer and a respected officer, Wheeler worked through the late 1950s to connect the need for a resolution to the Indus Basin dispute to the urgency of food and population crises. In April 1959, Wheeler chaired discussions between representatives of India and Pakistan held in London to finalize each nation's claims to the portions of the Indus River system.

During these discussions, Wheeler emphasized the need for both nations to invest in increased agricultural output, regardless of what water resources they would ultimately be awarded.[562] During the subsequent weeks spent negotiating the treaty, Wheeler secured Pakistan's relinquishment of all claims to the eastern rivers of the Indus Basin — the Sutlej, Beas, and Ravi — in exchange for guaranteed total usage rights on the remaining three rivers within Pakistani territory. To secure this deal, Wheeler offered, on behalf of the IBRD, extensive loans to Pakistan for the development of the nation's food production capacity in the Indus River Basin. On principle, whatever water volume West Pakistan lost to India would be redeemed through a large surplus derived from investments in new canals, tube wells, and alterations to the existing river channels in Pakistan to promote agricultural usage. India, in turn, would enjoy a freer hand to pursue hydroelectric projects in the Himalayan regions and agricultural reclamation schemes in Rajasthan with the three rivers reserved for its exclusive use. In this way, the ability of both nations to feed their populations through the promise of increased agricultural production emerged as the major bargaining chip during the negotiation of the Indus Waters Treaty.

At the same time, the IBRD coordinated with the Ford Foundation to offer both India and Pakistan loans for investments in American-made chemical fertilizers and pesticides, with the promise that they would improve soil and crop quality, delivering

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[562] "Report: Uses of the Waters of the Western Rivers," April 1959, Folder 1787793, India-Pakistan – Indus Waters Treaties – Agricultural Use by India on the Western Rivers – Correspondence 01, WBG.

vastly increased food grain yields. Further, Harry Curran, the World Bank's resident representative in New Delhi, regularly coordinated with Ford Foundation officials in determining the approach both organizations would take to the Government of India's proposed development investments. In February 1960, for instance, Curran reported back to his superiors in Washington, relaying the findings of a recent Ford Foundation report entitled, "India's Food Crisis."[563] Curran wrote that Ford's agricultural experts had determined that, given recent rates of population growth and food production, "there would be a deficiency of 28 million tons of food grains by 1966 which could not be covered by any conceivable program of imports or rationing."[564] Ford's experts, he noted, urged an "all-out emergency food production program" that would gear the Government of India's upcoming Third Five-Year Plan toward meeting that predicted shortfall.[565]

The Ford Foundation's emerging plans for preventing a potential food crisis through the promotion of high-yielding seeds and chemic fertilizers did not go unchallenged, however. In July 1960, Curran wrote once again to IBRD Loan Officer Stewart Mason in Washington, expressing his frustration with the Indian Planning Commission's apparently wrongheaded approach to the nation's food problem. Curran speculated that Penderel Moon, the former British colonial civil servant who had remained in India as the economic adviser to the Planning Commission, exerted disproportionate influence in turning commissioners against investments in increased production. As he wrote:

> Doug (Ensminger) is depressed in general about the Planning Commission. Like many others, he feels it has become a tired body, badly in need of an injection of fresh red blood. In particular he is naturally depressed by the Planning

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[563] Harry Curran to G. Stewart Mason, February 22, 1960, p. 5, Folder 1840734, India – General – General Negotiations – Correspondence, Vol. 11, WBG.
[564] Ibid.
[565] Ibid.

> Commission's hostility to his ideas on food production and he blames especially (Penderel) Moon whose influence on V.T. (Krishnamachari) and Tarlock [*sic*] Singh has been, he believes, considerable and disastrous.[566]

Further, Curran continued: "Whenever I have discussed food production with Moon, he has argued that all this expenditure on fertilizers is unreasonable and a North American racket. His own solution is simply that better use should first be made of existing resources."[567] Here, tension emerged between officials championing increased food production and those advocating for greater efficiency. While Curran and Ensminger argued for growing exponentially more grain with the aid of fertilizers purchased by the Government of India through the Ford Foundation, Moon recommended waste reduction and the full employment of existing resources. Moon's storied career in the Indian Civil Service (ICS) spanned Partition, establishing him in some sense as a fixture of continuity with the old imperial administration. Curran noted that Moon's views on population management held sway with certain members of the Indian Planning Commission, including Punjabi economist Tarlok Singh. At the same time, Curran observed that the aging British civil servant served only as an advisor to the Commission and would finally retire from his service to the Government of India the following summer, some fourteen years after Partition. Indeed, as Curran wrote, Nehru himself had indicated his personal support for the rapid grain production increases promised by the Ford Foundation and its fertilizers and pesticides. He only needed wider support on the Planning Commission to bankroll the expensive enterprise within the Third Five-Year Plan.[568] In this way, by 1960, the argument for a distributive solution to India's food woes seemed a lost cause. The goal

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[566] Harry G. Curran to G. Stewart Mason, July 19, 1960, Folder 1787294, Indus Basin Dispute – India Comprehensive Plan – Correspondence, WBG.
[567] Ibid.
[568] Ibid.

of dramatically increased production would come to dominate policy discussions in both India and Pakistan through the 1960s.

The Indus Waters Treaty, and its associated agricultural development projects bankrolled by the World Bank, emerged in the midst of the debate between increased food production and more efficient food storage, pricing, and distribution. An heir to the Guinness brewing fortune and a distinguished hydrological engineer in his own right, Kenelm Guinness was hired by Walker and the IBRD to estimate the potential of the Indus Waters Project for generating a food grains surplus in South Asia. In February 1960, Guinness estimated in his report to the IBRD that the Project would provide 15 million acre-feet (MAF) and 13 MAF of additional irrigation water for India and Pakistan, respectively.[569] These new water resources would be drawn from a new network of dams, canals, and wells funded by the World Bank at an expense of some $1.1 billion. On the Indian side of the border, the IBRD projected that this additional water would allow for an additional 4.4 million acres of productive farmland in the Thar Desert regions of Rajasthan alone, with an annual water surplus that could be utilized for future agricultural development.

All told, Guinness estimated that the Indus Waters Project would sustain an additional 9.2 million acres of fertile new farmland across the Indus River Basin, in both India and Pakistan. In this way, far from a mere adjudication of an international boundary dispute, World Bank officials promoted the project as a groundbreaking development initiative that would restore the fertility of the region's soil and dramatically improve agricultural production. Rather than share existing resources through a cooperative agreement, both the Indian and Pakistani delegations could leave the negotiating table with

[569] "Indus Waters Project – Preliminary Assessment of Cost/Agricultural Output Relationship," Folder 1787824, Indus Basin Multi-Purpose Project/Irrigation – Pakistan – Loan 0266 – P010016 – Treaty and Fund Project – Negotiations, Vol. 1, WBG.

a concrete plan to launch separate agricultural development projects that would generate millions of acres of new farming land. Almost as an afterthought, the IBRD noted that existing cost estimates did not include a reliable projection for the private investment needed to productively farm these millions of acres of land. With public investment in excess of $1 billion, the Guinness estimate meant that the value of new agricultural output across both India and Pakistan would amount to about $277 million. As the IBRD report concluded, "The cost/output ratio, therefore, closely approximates to 4 to 1. This could be considered as reasonably satisfactory from the economic aspect."[570] In this way, the Indus Waters Project would increase grain yields, but at definite cost to the Indian and Pakistani states, not to mention individual farmers and investors in the border region

PROTECTING THE FERTILITY INVESTMENT

Three bankers arrived in Delhi on February 24, 1960 as part of an eight-week mission to make a "detailed assessment of economic conditions" in both India and Pakistan and to reemphasize the need for increased food production in the Indus River Basin.[571] A crowd of reporters and representatives of the Government of India stood on-hand at Safdarjung Airport to greet Hermann J. Abs, chair of Deutsche Bank, Sir Oliver Franks, chair of Lloyds Bank Ltd., and Allan Sproul, chair of the New York Federal Reserve.[572] Fresh from their month-long tour of West Pakistan, the bankers represented the IBRD's latest effort at jumpstarting economic growth in South Asia. Organized by IBRD chairman Eugene Black at the behest of United States senators John F. Kennedy and John Sherman Cooper, the visit had already accomplished its implicit objective of building publicity for

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570 Ibid.
571 "Bankers' Mission to India and Pakistan: A Letter to the President of the International Bank for Reconstruction and Development," 1960, p. 1-2, Folder 1697894, Pakistan – General – Missions – Three Wise Men – Correspondence, Vol. 1, WBG.
572 Ibid.

Western aid to South Asia in that the Pakistani press labeled the tour a visit of the "Three Wise Men."[573] The name stuck and the three experts bore the moniker with them into India.

The Bankers' Mission served the related goal, articulated by Kennedy, of building upon the successes of the Indus Waters negotiations by "performing a public guidance function in the United States and other nations."[574] Further, Kennedy highlighted the importance of the bankers' mission in setting the economic agenda of India's upcoming Third Five-Year plan. As he wrote to World Bank president Eugene Black in October 1959: "I know we share fully an awareness of both the practical and symbolic influence of India and the vital importance of setting her Third Plan on a clear and calculable course."[575] In this way, the World Bank would involve itself in steering the Third Five-Year Plan toward an emphasis on producing substantial and calculable increases in agricultural production. In addition to heralding this proposed emphasis, the bankers' mission of early 1960 also provided an opportunity for building international awareness of the economic development work of the World Bank. It also served as an opportunity for these three eminent international economists to offer spot diagnoses of the causes of underdevelopment in South Asia. In West Pakistan, for instance, Abs, Franks, and Sproul announced that they had identified the new nation's chief obstacle to growth: the limitations of its natural environment.[576]

Echoing the concerns over maintaining the health and fertility of the nation's soil expressed by their colleagues working to finalize the Indus Waters Treaty, the three

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[573] G. Stewart Mason to Harry G. Curran, January 14, 1960, Folder 1837568, India – General – Missions – Three Wise Men – Correspondence, Vol. 1., WBG.
[574] John F. Kennedy to Eugene Black, October 17, 1959, Folder 1837568, India – General – Missions – Three Wise Men – Correspondence, Vol. 1., WBG.
[575] Ibid.
[576] Allan Sproul to Eugene Black, 1959, Folder 1837568, India – General – Missions – Three Wise Men – Correspondence, Vol 1, WBG.

bankers stressed that West Pakistan must address the "loss of good agricultural land through waterlogging and salinity" to meet the food consumption demands of an expanding population.[577] They also cited a high birth rate, lower mortality, and Pakistan's absorption of "many millions of refugees" during Partition in 1947 as contributing factors in the nation's burgeoning population crisis, but soil health represented their central concern.[578] To meet the challenges posed by rapid population growth, Pakistan must agree to a water resources settlement with India and invest heavily in increasing grain yields through the widespread use of new fertilizers and pesticides. The World Bank, they noted, could fund just that sort of endeavor. The Wise Men had indeed arrived in South Asia, bearing not gifts but loans.

In New Delhi, as in Karachi, the bankers spoke of soil degradation, the limits of South Asia's food production capacity, and the eagerness of the World Bank to provide loans for projects deemed necessary in averting a Malthusian catastrophe. In their report to the World Bank President Eugene Black, the bankers evaluated the fiscal allocations of the Nehru government's Third Five-Year Plan. Out of some $20 billion in proposed spending, the bankers lamented the fact that only $3 billion had been slated for agricultural development.[579] More would be needed, they stressed, to reclaim land, restore soil fertility, and secure increases in food grain production the bankers argued would avoid an impending calamity. At the same time, they applauded Nehru's willingness to invest in new agricultural technologies — including fertilizers, pesticides, and high-yielding seeds being advocated through the projects of the Ford and Rockefeller foundations. To develop the agricultural regions along the border between India and West Pakistan, the three bankers

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[577] *Banker's Mission,* 5.
[578] Ibid., 7.
[579] Ibid., 14.

recommended that the IBRD offer capital development loans to both governments. They also concluded that the IBRD would need to lobby both governments to remove barriers to private and foreign direct investment.[580] The border region, on the verge of a permanent settlement in the Indus River Basin dispute could prove to be the central venue for a revolution in agricultural production. With the proper infrastructure, they noted, it might also become prime real estate for international investment.

Seven months after the "Three Wise Men" paid their visit to South Asia, Indian Prime Minister Jawaharlal Nehru and Pakistani President Mohammad Ayub Khan signed the Indus Waters Treaty in Karachi, West Pakistan on September 19, 1960.[581] IDA Vice President Bill Iliff signed on behalf of the World Bank, finalizing the three-party compact and completing the international agreement that to this day governs hydrological and agricultural resources along the Indo-Pakistani border. The connection between water, soil fertility, and the potential of new high-yielding seed varieties to increase Indian food production proved clear within the negotiations surrounding the treaty. Greater food grain production could simply not be attained if one element of this equation proved faulty.

CONCLUSION

In April 1964, the agricultural scientist Norman Borlaug of CIMMYT in El Batán, Mexico reported to the Rockefeller Foundation's field office in New Delhi on his recent inspection of the IARI's progress in wheat research in Punjab. Borlaug wrote that he had observed significant progress by Indian scientists at research stations in Ludhiana and Karnal. At both sites, IARI scientists had made significant progress in cultivating high-yielding Indian wheat at levels of fertilization and in successfully growing Mexican hybrid wheat varieties developed at CIMMYT. In particular, the Sonora 63 and 64 and Lerma

[580] Ibid.
[581] Gilmartin, 220.

Rojo 64A wheat varieties, which demanded heavily-fertilized, well-irrigated soil, had been "beautifully adapted" to conditions in Punjab.[582] As he wrote:

> During the past year the advances in varietal improvement have catalyzed advances in soil fertility and agronomic research. […] The overall stimulating effect of these discoveries should propel the research program forward with vigor during the next several years. If this is done and if research results are extended aggressively to the cultivator's plots, a revolution in irrigated wheat production will result within the next five to seven years.[583]

In this way, the water supply increases promised by the Indus Waters Treaty of 1960 and the emphasis placed upon improving soil health within it would enable the extensive cultivation of these high-yielding wheat varieties across Punjab. Further, the Rockefeller Foundation and the IARI's advocacy for the wider use of chemical fertilizers would enable Punjabi farmers to cultivate these varieties extensively. In turn, the extensive cultivation of these and other varieties demanding fertile, well-irrigated soils, would enable the rapid wheat production increases commonly associated with South Asia's Green Revolution.

Over the course of the first twelve years following Partition, representatives of the World Bank had furthered a notion of soil health in the context of national integrity. They also employed an evolving canon of international development expertise that determined how international resource disputes could be adjudicated and how national frontiers could be legally defined and administered. Negotiated by the IBRD, the Indus Waters Treaty of 1960 enabled the new states of India and Pakistan to exert power over both the natural environment and their national populations. With the cooperative development plan proposed by David Lilienthal in 1951 firmly rejected by both India and Pakistan, only a

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[582] N. E. Borlaug, "Indian Wheat Research Designed to Increase Wheat Production," April 11, 1964, p. 1-2, Folder 546, Box 84, Series II, RG 6.7, New Delhi Field Office, RF, RAC.
[583] Ibid.

permanent division of resources could resolve the demographic precariousness Partition appeared to have generated.

In this way, American philanthropic organizations and international institutions worked with two national governments to define and administer the border between India and West Pakistan through the 1950s and into the 1960s. They divided the subcontinent's hydrological and soil resources, engaging on the international stage to carve out spaces for their respective nations. The negotiations between India and Pakistan, as well as the prescriptions proffered by the World Bank Group, drew upon the precedents of earlier boundary and water rights settlements between Mexico and the United States. Moreover, the border itself became a project of the "developmentalist state," evolving through exchanges with the "transnational development regime," outlined by Subir Sinha.[584] It also served as a space in which a long process of decolonization unfolded and interacted with international experts and global priorities, setting the stage for the Green Revolution of the late 1960s and 1970s.

The division of South Asia's soil and water resources over the course of the 1950s proved to be an important turning point in the work of the Rockefeller and Ford foundations, as well. With the flow of irrigation waters across the Indus River Basin insured and, by extension, the production of more nutrient-rich soil guaranteed, the scientific experts of both philanthropic organizations moved forward with confidence to increase their investments in wheat and rice across the region. As this chapter has shown, the Indus Waters Treaty of 1960 — negotiated by the World Bank Group in conversation with both Ford and Rockefeller foundation officials — generated the conditions in which

[584] Sinha, 59.

the scientists of these philanthropic organizations believed their agricultural investments would thrive.

Conclusion: Towards the Obscurity Ahead

Today, just north of Sonipat in the state of Haryana, the Daawat Foods Limited rice mill looms above the traffic on National Highway 1. An image of actor Amitabh Bachchan, Daawat's celebrity spokesperson, beams down proudly from each of the mill's six massive storage drums. Situated on the same road that links what remains of the ambitious community development project at Nilokheri to modern-day Delhi, the massive milling complex serves as a vivid reminder that the region is now one of South Asia's largest producers of high quality basmati rice — a result, in part, of broad investments made in the region's agriculture by the Government of India in the late 1960s and 1970s.[585] One hundred kilometers to the north, the village of Nilokheri still hugs the outsized central traffic circle designed by B. D. Manda under the direction of S. K. Dey as the rehabilitation township became a community development project. The Haryana Institute of Rural Development and the Extension Education Institute of the Haryana Agricultural University, heirs to the regular extension training programs held in Nilokheri through the 1950s, remain as important state-wide centers for educating farmers in management skills and cultivation practices.[586] Indeed, the Extension Education Institute holds multiple training seminars each season, playing an important role within the state's broader curriculum of education for farmers and village level workers. A portrait of Dey still hangs in the conference room there, a quiet reminder of the institution's roots in the bold plans launched by Dey and Douglas Ensminger of the Ford Foundation. Following the decline of India's community development efforts, however, Nilokheri itself never attained the prominence that Dey intended for it.

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[585] Sandeep Kumar et al., "Biology of Whitebacked Plant Hopper, *Sogatella Furcifera* on Basmati Rice under Agroclimatic Condition of Haryana," *Agricultural Science Digest* 35, no. 2 (2015): 142.

[586] I visited Nilokheri in August 2015 and was hosted by instructors and administrators from both institutions. I extend my sincere thanks to them within the 'Acknowledgements' section above.

Not unlike the training centers in Karnal, the All-India Institute of Hygiene and Public Health (AIIH&PH) remains funded by the Government of India and offers courses for public health professionals in topics as varied as epidemiology, maternal and child health, biochemistry and nutrition, and environmental sanitation.[587] The AIIH&PH also continues to manage the Rural Health Unit and Training Centre at Singur, which provides a venue for the training of undergraduate and postgraduate students in public health. It also offers primary care services to a population of over one lakh still included within the study area.[588] In Hyderabad, too, the original mission of the Nutrition Research Laboratories at Coonoor continues with only minor modifications under the banner of the National Institute of Nutrition (NIN). So renamed in 1969 in honor of its fiftieth anniversary, the laboratory founded by Robert McCarrison to investigate the causes of beriberi has become India's largest nutrition research institute.[589] While the Rockefeller Foundation that had invested in the AIIH&PH and the predecessors of the NIN concluded its work in India in 1973, the Ford Foundation and Population Council both continue to play significant — if at times controversial roles — in financing public health, agricultural science, and social development projects in South Asia.[590] Prime Minister Narendra Modi's administration, for instance, placed restrictions on the work of the Ford Foundation in India during the summer of 2015 for allegedly providing a $250,000 grant to a critic of the prime minister. The Modi government identified the foundation as a potential threat to national security for providing funds to two "anti-India" organizations managed by the activist Teesta

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587 "The Institute," All-India Institute of Public Health, accessed February 17, 2017, aiihph.gov.in.
588 "Rural Health Unit & Training Centre, Singur," All-India Institute of Public Health, accessed February 17, 2017, aiihph.gov.in/rural-health-unit-training-centre-singur/.
589 "NIN," National Institute of Nutrition, accessed February 17, 2017, ninindia.org/nin.htm.
590 See "India, Nepal, and Sri Lanka," Ford Foundation, accessed February 18, 2017, http://www.fordfoundation.org/regions/india-nepal-and-sri-lanka/. and "Country of Research: India" Population Council, accessed February 18, 2017, www.popcouncil.org/research/india.

Setalvad.[591] The Government of India ultimately removed Ford from its threats watch list in March 2016 and resumed its sixty-four-year-old relationship with the organization.[592] In this way, the philanthropic interventions of the 1950s that established new scientific networks and institutions and set the terms of postwar international development discourse continue to have resonance across South Asia today.

Beyond long-standing institutions and enduring scientific networks, the interventions of the 1950s and 1960s and the Green Revolution that they enabled continue to affect millions of lives across rural South Asia. Vandana Shiva, for example, has recently argued that, "Instead of abundance, Punjab has been left with diseased soils, pest-infested crops, waterlogged deserts and indebted and discontented farmers."[593] The implications of the capital-intensive pattern of agricultural development established in part by the Green Revolution have been similarly highlighted in the media coverage and scholarly examinations of the high rate of suicides among heavily-indebted small farmers over at least the past two decades.[594] This tragic phenomenon has received attention as a public health issue in and of itself, with medical researchers concluding that indebtedness due to the high cost of agricultural inputs and relatively low returns on crops leads small farmers to take their own lives.[595] At the same, Sam Grey, Raj Patel, and other scholars have advocated for local movements toward attaining food sovereignty across the developing

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[591] "Ford foundation funding dries up as Modi clamps down on NGOs," *The Times of India,* July 14, 2015. Accessed February 2017. timesofindia.indiatimes.com/india/Ford-Foundation-funding-dries-up-as-Modi-clamps-down-on-NGOs/articleshow/48071357.cms.
[592] Singh, Vijaita, "Ford Foundation taken off watch list," *The Hindu,* March 18, 2017. Accessed February 2017. www.thehindu.com/news/national/ford-foundation-taken-off-watch-list/article8366862.ece.
[593] Vandana Shiva, *The Violence of the Green Revolution: Third World Agriculture, Ecology, and Politics* (Lexington, KY: University Press of Kentucky, 2016), 19.
[594] Jonathan Kennedy and Lawrence King, "The Political Economy of Farmers' Suicides in India: Indebted Cash-Crop Farmers with Marginal Landholdings Explain State-Level Variation in Suicide Rates," *Globalization and Health* 10, no. 16 (2014): 1-2.
[595] Ibid.

world as a means by which communities might be able to maintain nutritional health. Such movements seek to counter landlessness among rural farmers, the increased cultivation of Genetically Modified Organisms (GMOs) at the expense of local crop varieties, and the monopolization of seed stocks by international corporations.[596] These ongoing debates and crises within the global food economy descend directly from the scientifically-driven efforts to restructure South Asian agriculture toward dramatically increased production during the long period of decolonization.

The preceding chapters have shown that the quest for greater food production in South Asia derived significantly from the priorities of agricultural scientists and rural extension advocates of the late colonial era prior to the storm of Partition. The emergent nutritional sciences and a rising doctrine of social intervention into the workings of rural communities profoundly shaped the agendas of the philanthropic and new international organizations that entered India in the aftermath of the Bengal Famine of 1943-44 and the Partition of 1947. In the wake of these crises, fears of overpopulation and food shortage drove efforts to transform Indian agriculture and regulate populations. The "double crisis" of food supply failure and rapid population growth, outlined by the British writer Aldous Huxley in 1948, served as a justification for interventions by the Rockefeller and Ford foundations, the Population Council, and other international agencies in their initial development projects across South Asia during the 1950s. As Nick Cullather has shown, the experts employed by American philanthropic organizations would attempt to "restore a putatively lost 'balance' between food supply and population" in the postwar era.[597] The assumption of a "double crisis" also set the stage for contemporaneous interventions in

[596] Sam Grey and Raj Patel, "Food Sovereignty as Decolonization: Some Contributions from Indigenous Food Movements to Food System and Development Politics," *Agriculture and Human Values* 32, no. 1 (2015): 431.
[597] Cullather, 7.

rural extension and education, nutritional health, and the management of water and soil as vital national resources. In turn, addressing rapid global population growth as a crisis of decolonization, such efforts established the point of departure for international development theory and practice in the postwar era.

In problematizing rural India as both excessively fertile in terms of human reproduction and desperately underproductive in an agricultural sense, the new developmentalist thinking of the postwar era set the stage for broad attempts to reshape South Asia's villages and farming communities. Independent India's community development and rural extension schemes of the 1950s, for instance, emerged in large part from the necessities of post-Partition refugee rehabilitation. Building upon the example of the state-funded rehabilitation township of Nilokheri in East Punjab, the Ford Foundation and the TCA worked closely with the Government of India to launch nationwide programming designed to reorder the countryside and stimulate food production. The rural extension education programs launched by the Allahabad Agricultural Institute similarly sought to extend the influence of the Ford and Rockefeller foundations in South Asia. These ambitious initiatives to transform villages and train thousands of novice farmers to become extension experts demonstrate the broad appeal of this developmentalist agenda of social intervention; this analysis extends upon recent work on community development and model villages in South Asia by Nicole Sackley and Daniel Immerwahr. I argue that the Indian version of community development emerged in important ways from the priorities of India's Ministry of Rehabilitation in the aftermath of Partition, revealing that this sort of intervention also represented a concerted attempt to shape the new nation's economy and define its citizenry. As the bureaucratic weight of the new Ministry of Community Development hindered programmatic progress through the early 1960s, the Ford Foundation adopted a model of intervention more like that of Rockefeller, financing direct

scientific research in agriculture. That said, these initial social interventions helped to shape Panchayati Raj and supported the rise of rural extension and agricultural education institutions that would endure for decades to come.

As the Ford Foundation supported experiments in community development and rural extension through the 1950s, the Rockefeller Foundation and the FAO also provided backing for laboratory and clinical research into nutrition. In transporting laboratory methodologies into village clinics and field sites, Indian scientists and FAO experts launched investigations into the causes of deficiency diseases and worked to assess the nutritional values of common Indian foodstuffs. This research reflected a new intersection between developmentalist theories and the nutritional sciences, reflecting a later instance of what James Vernon has termed the "humanitarian discovery of hunger" in the context of international development.[598] Further, investments made by the Rockefeller Foundation and the FAO in the work of the All-India Institute of Hygiene and Public Health (AIIH&PH) and the Nutrition Research Laboratories at Coonoor and Hyderabad guided the research agendas of both institutions through the 1950s. Demonstrated in part by the careers of V. N. Patwardhan, W. R. Aykroyd, and Muktha Sen, these investments supported the rise of a global scientific network through which the findings of local nutritional research might be shared. During that period, while agricultural scientists and development experts pursued wide-ranging, capital-intensive initiatives across South Asia, the nutritional sciences engaged the food situation at a physiological level, taking the human body as the central site of investment, intervention, and experimentation. Diet and nutritional health surveys gathered socioeconomic and biochemical data from India's most vulnerable populations. Laboratory scientists and physicians compiled compendia

[598] Vernon, 17-18.

advertising the "proper" ways of choosing, cooking, and eating India's common foods. As I argue, these interventions turned on a constant negotiation between individual care on the one hand and the wider realm of public health surveillance on the other. This relation would lead nutritionists and dietitians into closer collaborations with the agricultural sciences, as both worked to assess the nutritional quality of South Asia's newly-developed high-yielding food grain varieties.

In the face of the perceived postwar population crisis, Indian and American scientists associated with the Rockefeller Foundation and the newly-organized Population Council also sought to examine and regulate rural populations. In so doing, they connected overpopulation concerns to ideas of seed and soil fertility, closely paralleling earlier international debates over soil conservation and population growth highlighted by Alison Bashford.[599] Eugenic notions of fertility regulation, in common currency in late colonial India as Sarah Hodges, Maneesha Lal, and others have shown, thus informed the first post-independence public health projects of the Rockefeller Foundation and the Population Council.[600] The "family planning action research" initiatives launched in rural communities by the Population Council and the Rockefeller Foundation during the 1950s paralleled similar efforts undertaken in the context of decolonization in the Caribbean, a phenomenon which Nicole C. Bourbonnais has recently examined.[601] Inaugurated in 1956, the Rockefeller Foundation's Indian Agricultural Program (IAP), moved rapidly to expand and improve India's maize and sorghum germplasms, investing as well in the hybridization of new varieties of both grains to secure higher yields. The Population Council and the Rockefeller Foundation collaborated with Indian scientific and medical institutions and the

[599] Bashford, 181-183.
[600] See Hodges (2006), 1-21; 85-114.
[601] See Bourbonnais, 1-29.

Indian central government to pursue a dual agenda influenced by eugenic notions. On the one hand, they sought to restrict human fertility; on the other, they worked to improve the fertility of crop plants. In view of promising developments in Rockefeller's grain hybridization initiatives and wider governmental interest in population control programming by the early 1960s, the American foundations gradually turned away from the capital-intensive social interventions represented by the Ford Foundation's earlier work in community development and rural extension. In the view of the Rockefeller Foundation's leaders and top scientists especially, only unprecedented improvements in the agricultural sciences could resolve the perceived imbalance between population growth and food supply. At the same time, the turn toward coordinated programming in the agricultural sciences in India became a vast experiment in and of itself, testing whether the research model that had brought Mexico dramatic improvements in grain production could lead to similar results for a much larger nation. Considering the rapid gains of this vast experiment through the late 1950s, the American foundations and the international agencies that worked with them in South Asia would work toward establishing conditions aimed at achieving a permanent agricultural abundance.

The World Bank Group (WBG) would be chief among the international agencies to collaborate closely with the Ford and Rockefeller foundation in securing their investments in South Asia through the late 1950s and early 1960s. The World Bank's economists and hydrologists worked to establish a permanent settlement of water rights in the Indus River Basin, placing special emphasis on ensuring the agricultural productivity and fertility of the region divided between India and West Pakistan, and culminating in the adjudication of the Indus Waters Treaty in 1960. Through these negotiations, World Bank officials advanced a notion of soil health as critical to integrity of the nation. They deployed an evolving international development expertise to determine how international resource

disputes could be resolved and how international borders might be administered without damaging agricultural productivity. Through the same period, the Rockefeller Foundation took similar steps to ensure the permanence of the productive gains secured through early efforts in grain hybridization. Most notably, Rockefeller scientists collaborated with the Indian Agricultural Research Institute (IARI), to test new high-yielding wheat varieties at research stations in Ludhiana and Karnal in Punjab. The American foundation also took on a powerful role in India, financing graduate programs in the agricultural sciences designed to ensure that scientific knowledge would be developed and shared domestically. In these ways, agricultural research proved vitally important to the framing of India's agricultural development policies through the 1950s and in advance of the later Green Revolution, just as Madhumita Saha has shown in her effort to "recover the history of agriculture in independent India before the Green Revolution."[602] Further, global institutions coordinated with the Indian and Pakistani states to establish permanent systems to regulate water resources, manage soil fertility, and guarantee the long-term profitability of South Asian agriculture. These structural changes within South Asia's food economy would justify the Rockefeller Foundation's ultimate investments in improving local wheat and rice varieties beginning in 1964 and culminating in the transfer of high-yielding dwarf wheat varieties developed in Mexico to India and Pakistan in 1966.

In weaving the above narratives together, I have argued that nationalist and colonial era concerns over food shortage and population growth profoundly influenced the agendas of the philanthropic organizations and international agencies that expanded their influence in South Asia after 1947. Following independence, as through the late colonial period, Indian agriculture became the subject of investments and interventions on the part of

[602] Saha, 203.

philanthropic scientists and humanitarian agents. I have shown that the careers of Indian and British colonial scientists extended across Partition, with many of them assuming roles in new international institutions and working closely with emerging American philanthropic organizations. Going beyond mere goodwill, however, their eagerness to reshape South Asia's food economy and to address overarching concerns regarding global population growth also converted the new nations of India and Pakistan the sites of social and scientific experimentation through the 1950s and 1960s. Further, this dissertation has attempted to set the Green Revolution, commonly viewed as a phenomenon of the late 1960s and 1970s, firmly in the context of a long era of South Asian decolonization. In turn, this analysis has engaged with both colonial and postcolonial historiographies, adding significant context to Raj Patel's recent conceptual sketch of a 'long' Green Revolution.[603]

I have tried to demonstrate that the institutions, ideas, and networks that proved pivotal within the global Green Revolution emerged in no small way from attempts to regulate rural populations and reorganize South Asian agricultural production into the 1950s and 1960s. This priorities and concerns expressed were expressed through what Subir Sinha has termed the "developmentalist state," subsequently engaging with the worldwide concerns of the "transnational development regime" that took shape in the aftermath of the Second World War and through the first global waves of decolonization.[604] In the final analysis, the fear of an obscure future coupled with a faith in the capacity of science to resolve social concerns, pushed and pulled South Asia toward the Green Revolution of the 1960s and 1970s in fits and starts. The forces unleashed by decolonization contributed significantly to the agricultural changes already underway during the mid-twentieth century. Decolonization also provided an opportunity and a

[603] Patel, 6.
[604] Sinha, 59.

justification for the involvement of American philanthropic organizations and international agencies in South Asia's food economy. A wide array of political interests would come to celebrate the fruits of these scientific investigations and social interventions, citing them as clear improvements to the human condition. For those swept up as unwitting research subjects or manipulated as movable pieces on a vast rural chessboard, the changes wrought by these developmentalist interventions appeared to be something less than progress.

Returning at last to Walter Benjamin's Angel of History, hurled backward by the storm called "progress" as he permanently faces the past, it is useful to recall the significance of this image for the philosophy of history. As Benjamin writes: "Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of his feet."[605] In this way, the long episode historians now view as the Green Revolution could not have been understood as a single event or a discrete era by those caught up in it. Instead, unlike the Angel of History, they faced an uncertain future. As Benedict Anderson reflects on Benjamin's celestial metaphor: "[T]his angel is immortal, and our faces are turned towards the obscurity ahead."[606] The scientists, physicians, and development experts who supported the agendas of the American philanthropic foundations and the new international organizations that sought to radically transform South Asia struggled to peer into that obscurity, imagining at once scenes of societal catastrophe and scientific triumph. Whether these visions were simply delusions or accurate predictions of things to come is beside the point. The lasting repercussions of their actions and the policies they pursued have proven to be real enough.

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[605] Benjamin, 257-258.
[606] Anderson, 147.

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Rockefeller Foundation Records, Rockefeller Archive Center – Sleepy Hollow, NY
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Vita

Jack Loveridge is originally from El Paso, Texas, on the border between the United States and Mexico. He received his Bachelor of Arts in History from Stanford University in 2007, where his honors thesis examined the response of the Indian Medical Service to the 1918-19 Influenza Pandemic. Two years later, he completed his Master of Philosophy in Development Studies at the University of Oxford, where he was an English-Speaking Union Scholar and a member of Green-Templeton College. His dissertation at Oxford tracked the history of South Asia's tobacco industry in the twentieth century and the parallel rise of tobacco-related illness as a concern of international health.

His doctoral work at the University of Texas at Austin has been supported in part by a Fulbright-Nehru U.S. Student Scholarship to India and two Foreign Language and Area Studies (FLAS) fellowships. His research has also received support from the Institute of Historical Research in London, the National History Center in Washington, and the Rockefeller Archive Center in New York. During the final year of his doctorate, he was the Brady-Johnson Predoctoral Fellow at Yale University's program in International Security Studies.

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This dissertation was typed by the author.